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SURGICAL DISEASES

OF THE

OVARIES AND FALLOPIAN TUBES

INCLUDING

TUBAL PREGNANCY

SURGICAL DISEASES

OF THE

Ovaries and Fallopian Tubes

INCLUDING

TUBAL PREGNANCY

BY

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WITH 146 ILLUSTRATIONS

NEW AND ENLARGED EDITION

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PREFACE.

My object in this, as in the First Edition, is to enable deduction from observation to replace hypothesis and speculation. To this end the facts recorded in my Essay "On the Diseases of the Ovaries and the Uterine Appendages," to which the Council of the Royal College of Surgeons, England, awarded the Jacksonian Prize in 1892, are herein incorporated.

Dr. Comyns Berkeley kindly assisted me in reading the sheets for the press.

J. BLAND SUTTON.

48, *Queen Anne Street,*
Cavendish Square, W.
March, 1896.

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SURGICAL DISEASES

OF THE

OVARIES AND FALLOPIAN TUBES;

INCLUDING TUBAL PREGNANCY.

Part I.

DISEASES OF THE OVARIES.

CHAPTER I.

SEX, AND THE GENITAL GLAND OF THE FEMALE.

Sex is a term used to express the characters by which an animal or plant is male or female. They may be arranged in two groups, primary and secondary.

Primary Sexual Characters.—These are directly associated with the essential function of reproduction, and comprise in the human female the ovaries, Fallopian tubes, and uterus. To these must be added the mammary glands.

The Genital Glands, or Ovaries.—These are the dominant sexual organs in the female; they vary in size. In outline a mature ovary is oval, but compressed in its long axis, which measures from 3 to 5 cm.; transversely it measures from 2 to 3 cm., and is about 12 mm. in thickness (Fig. 1). It weighs about 6 grammes. It is rare to find both ovaries of equal size.

The smoothness of its surface is interrupted by prominences caused by ripening follicles (Figs. 3 and 4), and

by scars which indicate the spots where follicles have ruptured.

Towards the close of sexual life the ovaries become smaller, and the shrinking of the stroma causes wrinkling of their surfaces. The external covering of the ovary is directly continuous with the posterior layer of the mesometrium (broad ligament).

On microscopic examination the ovary will be found to

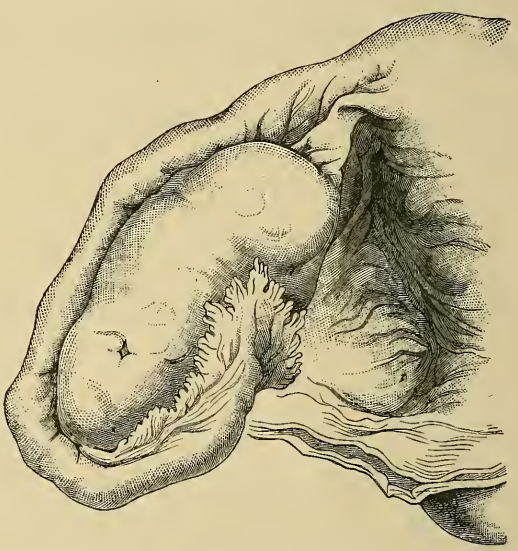

Fig. 1.—Ovary of a Woman Twenty-three Years old, with the Fallopian Tube in Position. Natural size.

consist of two distinct parts. That portion forming its free border is the **oöphoron**; it is the egg-bearing segment, and is full of follicles in various stages of development, maturation, and decay. The ripe follicles are easily recognised by their size, and the recently ruptured follicles usually present themselves as **corpora lutea**, so called in consequence of the peculiar yellow-coloured tissue of which they are mainly composed.

The Ovarian Follicles.—The usual description of the cells lining the wall of an ovarian follicle, the membrana granulosa as it is called, affords a very poor idea of the

richness and potentiality of this epithelium. In women and in monkeys, when the sections are prepared from suitable ovaries, the epithelium will be found to approach in its degree of development that represented in the ovarian follicle of the cat (Fig. 2), but differs in consisting of two or more layers.

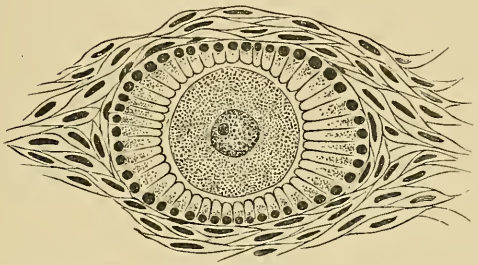

Fig. 2.—Ovum in its Follicle ; from a Cat. (After *Klein* and *Noble Smith.*)

That portion of the ovary in relation with the hilum is the **paroöphoron**; it never contains follicles, and is usually composed of fibrous tissue traversed by numerous blood-vessels. In young ovaries the paroöphoron may present

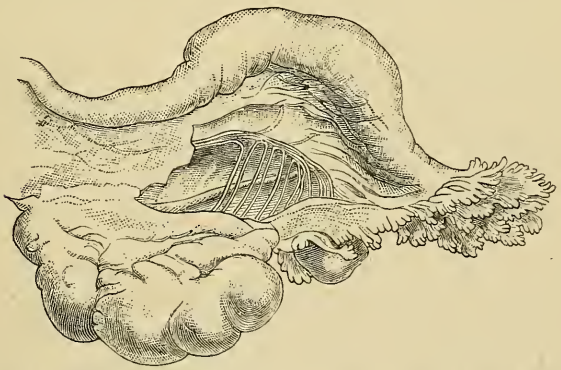

Fig. 3.—Ovary from a Woman Forty Years of Age. Natural size.

remnants of gland tubules, vestiges of the *mesonephros* (Wolffian body) from which it is mainly derived. The excretory tubules and ducts of that interesting structure are invariably attached to the ovary and known as the

parovarium. The ova after their escape from the ovary fall into the cœlom (peritoneal cavity) and enter the Fallopian tube in order to be conducted to the uterus.

Observations on living monkeys have enabled me to determine that the tubal ostium lies in the closest possible proximity to the ovary, and fluid in varying quantity is always present in the recto-vaginal pouch; consequently the tubal fimbriæ float freely like water-weeds in a pond. The dehiscence of an ovum produces a temporary vortex in this fluid, and the ovum is thus carried into the tubal ostium and propelled by the contractions of the muscular coat of the tube into the uterine cavity, on the same principle that food is conveyed along the gullet to the stomach, or urine from the kidney to the bladder through the ureter. The old notion that the fimbriated end of the Fallopian tube is able to grasp the ovary and secure an ovum at its dehiscence is a fable.

It is a remarkable fact that the early embryo of all mammals possesses in a potential form the primary sexual organs of both sexes. After a certain period one set of organs predominates and determines the sex. Every mature female possesses vestiges of the male sexual organs except the genital glands (testes); and every male has remnants of the female sexual organs, save the ovaries.

Secondary Sexual Characters.—This term is applied to those features which enable us to distinguish male and female, irrespective of the organs of reproduction and those used for the nourishment and protection of the young.

The characters belonging to this group, so far as the human family is concerned, are exclusively in the possession of the male. Man is distinguished from woman not only in the possession of a beard and greater muscular development with its necessary accompaniment, greater physical strength, but he has a more powerful voice, and the skin of his trunk and limbs is thick and more abundantly supplied with coarse hair, which has a somewhat different disposition than in woman. In man the front of the chest is usually covered with hair, and that on the mons Jovis passes upwards to the umbilicus, whereas in woman it is restricted to the mons Veneris. A less constant feature, but one which seems

confined to men, is a luxuriant growth of hair on the prominence of the pinna known as the tragus.

Secondary sexual characters are not present in the young, but become manifest at **puberty**, by which term we signify *reproductive maturity*. At this period the generative organs increase in size, and become functionally active. In the female puberty is more strikingly declared by the institution of **menstruation.**

It is a remarkable fact that, as Darwin observes, "throughout the animal kingdom, when sexes differ in external appearance, it is, with rare exceptions, the male which has been the more modified; for, generally, the female retains a closer

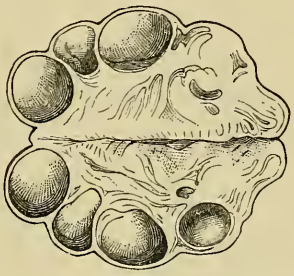

Fig. 4.—Section of Ovary showing ripening Follicles. Natural size.

resemblance to the young of her own species than to other adult members of the same group." This is well shown in the human family, for up to the period of puberty, so far as secondary sexual characters are concerned, the boy resembles the female as much as he does the male, but after that period he begins to assume secondary sexual characters indicative of the man.

It is well known that if the sexual glands be destroyed, either designedly or by disease, the boy will retain feminine peculiarities. The voice will remain of a childish treble, hair is scanty over the pubes, the skin is soft, and the beard fails to appear. There is a great tendency to an abnormal deposition of fat in the subcutaneous tissues. All these conditions are exhibited in the case of eunuchs.

In children with malformation of the genital organs the secondary sexual characters are not only late in appearing,

but are imperfectly developed. In questionable cases of sex the only absolute test is the genital gland. The presence of an ovary is decisive proof of a female, and the testis indicates the male. Many cases have been observed in which a uterus was associated with testes.

The parts represented in Figs. 5 and 6 were obtained from an infant whose external genitals made it doubtful whether it

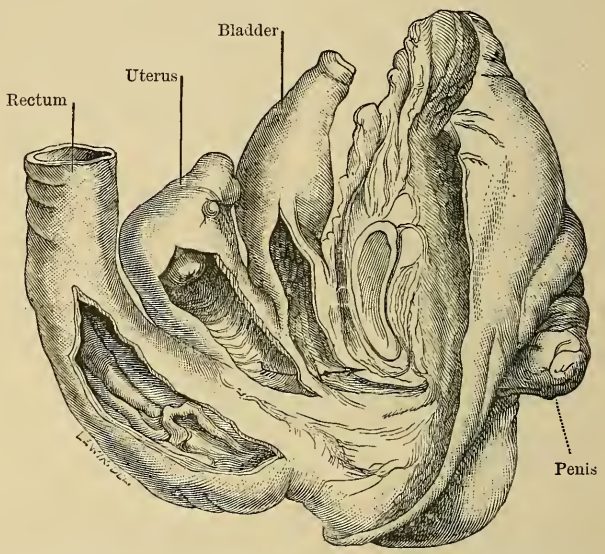

Fig. 5.—Internal Genital Organs of a Male Child, showing a Uterus opening into the Urethra at the Sinus Pocularis. The orifice is represented by an arrow.

was male or female. There was a well-formed uterus opening into a typical male urethra at the sinus pocularis. The genital glands were examined microscopically and found to be typical testes.

Shattock has pointed out that in the fœtus a membranous fold surrounding the opening of the sinus pocularis represents the hymen in the male; the sinus itself is the homologue of the vagina. In support of this view is the incontrovertible fact that when a perfect uterus exists in the male the vaginal segment of the uterus always communicates with the urethra by way of the sinus pocularis. In an example of a uterus in a male child with normally formed penis and scrotum,

but undescended testes, which came under my own observation, the hymen at the sinus pocularis was imperforate, and the uterine cavity and cervical canal were dilated and distended with mucus. The specimen is preserved in the museum of the Middlesex Hospital.

The nature of the genital gland cannot be determined by naked-eye appearances, but in doubtful cases must be examined microscopically. On several occasions bodies suspected to be ovaries have turned out to be testes when

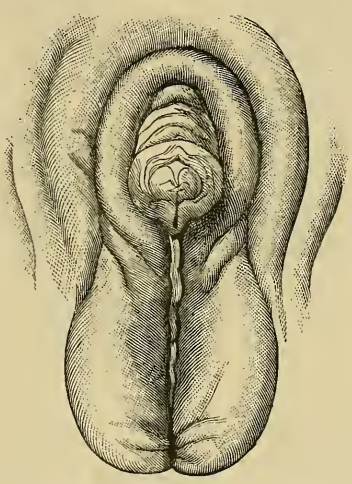

Fig. 6.—External Genital Organs, showing an imperfectly developed Penis.

submitted to this test. (*See* chapter iv.) No example has yet been recorded in the human family of a functional ovary co-existing with a functional testis, or the combined condition, so common in frogs, known as an ovo-testis.

The association of testes with a uterus and Fallopian tubes is by no means confined to the human kind; it occurs in swine (Fig. 7), sheep, mares, and oxen. Stockbreeders are aware that a cow-calf twin-born with a bull-calf is usually sterile; it is known as a "free-martin." Free-martins are pseudo-hermaphrodites. It is a fact of great importance that in pseudo-hermaphrodites the genital glands are invariably testes.

Children with their external genitals so imperfectly

developed as to leave in doubt their sex are often termed *pseudo-hermaphrodites*, and the majority are brought up as girls. This is a misfortune and a great injustice, for with the advent of puberty, which in these circumstances is often

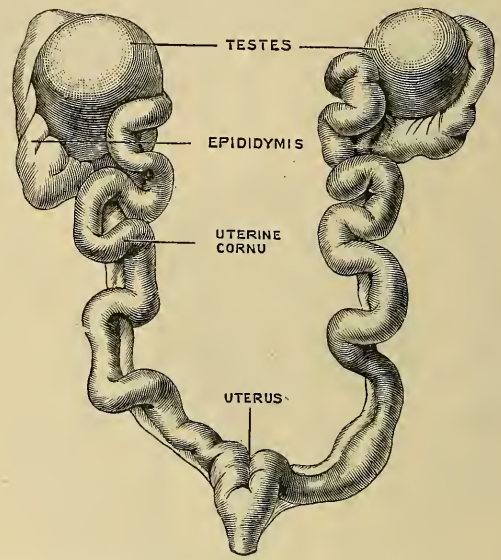

Fig. 7.—Uterus and Testes removed from a Pig in the Operation known as Spaying.

greatly delayed, the supposed girl suddenly assumes the voice of a man and begins to grow a beard.

It is a good rule to bear in mind that when there is doubt as to the sex of a child, always advise, when consulted as to its up-bringing, *that it should be named, trained, and educated as a boy.*

CHAPTER II.

MENSTRUATION.

Interference with menstruation—the monthly discharge of blood from the uterus—is such a very important feature in ovarian and tubal disease that it is necessary to consider the chief points connected with this strange phenomenon early in this volume. In the British Isles the average age at which menstruation begins is the fourteenth year, and it continues till the forty-fifth year. It consists in the escape from the vagina of a bloody fluid, resembling prune juice in colour, acid in reaction, and non-coagulable. Menstrual fluid consists of blood-corpuscles and epithelium furnished by the mucous membrane of the uterus and vagina. The actual source of the blood is the mucous membrane of the uterine cavity. The flux lasts on an average five days, and the quantity is about six ounces. The normal menstrual rhythm is twenty-eight days, counting from the beginning of one period to the beginning of another.

Concerning the cause, significance, and utility of menstruation we know nothing, and there is even much diversity of opinion regarding the changes in the uterus at the menstrual period.

It is believed by many that menstruation is accompanied by gross changes in the uterine mucous membrane. Pouchet* maintained that an exfoliation of the epithelium of the uterus occurred monthly in women and mammalia generally, and that there was also destruction and expulsion of the mucous membrane.

Sir John Williams† has forcibly urged a similar opinion in regard to women. His observations led him to believe that at each menstrual period the epithelium and subjacent parts of the mucous membrane lining the uterine cavity are shed, the denudation commencing at the internal os and extending

* Farre's article "Uterus," Todd's "Cyclopædia," vol. v., Supplement, p. 666.

† *Obst. Journal*, vol. ii., 1875.

to the fundus, the lost tissues being regenerated in the intermenstrual period.

From this extreme view many observers have dissented. Some believe that only the most superficial parts of the mucous membrane are detached, whilst others state that it remains intact, not even the ciliated epithelium being lost. Opinions were so contradictory on this subject that there seemed little chance of reconciling them. A study of the mucous membrane of uteri obtained from young women dying during menstruation induced me to believe that the loss of tissue described by many writers is the result of *post-mortem* change, due to the almost insuperable difficulties of obtaining the parts before they lost their tissue-life. It occurred to me, therefore, to examine the conditions of the mucous membrane of the Fallopian tubes of women during menstruation, and also to investigate the uterine and tubal mucous membrane of Macaque monkeys (Fig. 9) during that period.

As far as my observations have extended, the only mammals which menstruate besides women are Macaque monkeys and baboons. In Macaques, menstruation is accompanied by certain unmistakable objective phenomena other than the escape of blood from the genital passage, for all the naked or pale-coloured parts of the body, such as the face, neck, and ischial regions, assume a lively pink colour; in some cases it is a vivid red. The amount of sanguineous discharge from the uterus is very slight and soon ceases, but the coincident coloration of the parts lasts from three to seven days. In warm weather, during menstruation, the labia are much swollen. The baboons present similar objective signs to the Macaques, but in an exaggerated degree; so that a menstruating baboon is anything but a comely individual. After witnessing these outward signs of menstruation in many Macaques and baboons, and ascertaining beyond all doubt that there was an actual flux of blood at these periods, some of them were killed when the catamenia appeared: some at the full height, and others at its decline. In most cases the uterus was removed, and placed in conservative media (Müller's fluid gave best results) the instant death occurred. This enabled me to obtain some beautiful and reliable specimens. In none of them could any trace

of destructive change be detected either in the uterus or Fallopian tubes—not even shedding of the epithelium.

The uterus of a Macaque monkey is very instructive for this purpose. In shape, and even in the structure of the mucous membrane and disposition of glands, it is so very similar to that of our own species that it may be described as a miniature human uterus. The glands and their ducts are lined with columnar ciliated epithelium.

My observations threw no light whatever on the source or cause of the hæmorrhage.

Fig. 8.—Entellus Monkey (*Semnopithecus entellus*).

The uteri of baboons gave similar results when the same precautions were observed in obtaining and preserving the specimens. The uterine glands in the baboon differ in shape from those of the Macaque. Instead of long tubular glands, they are crypts in the mucous membrane, recalling in a striking manner the Lieberkühnian recesses of the intestine. The uterine glands of the baboon often present shallow diverticula at their bases; the glands are so closely packed together that the mucous membrane, when seen in section, has a villous appearance. The epithelium is columnar and ciliated.

The Fallopian tubes of the Macaques were especially subjected to microscopic examination, and, like the uterus, showed no evidence of epithelial change.

This induced me to examine microscopically Fallopian tubes from the human female during menstruation. This seems to have been neglected by previous writers on the subject. The Fallopian tubes examined were obtained by operation performed for ovarian tumours, or to produce an

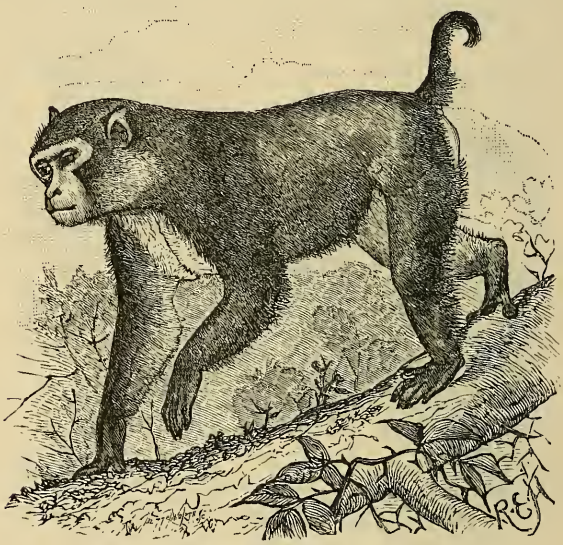

Fig. 9.—Macaque Monkey (*Macacus rhesus*).

artificial menopause in women suffering from uterine myomata. The tubes specially investigated were those removed during menstruation, and immediately after their abstraction were put into preservative media. None of the specimens showed any change in the mucous membrane or epithelium.

My observations were communicated to the British Gynæcological Society in 1886. The inquiry has been continued at intervals since that date as leisure and opportunity allowed, and the conclusions arrived at are simple.

1. Macaque monkeys and baboons living captive in London suffer a periodical loss of blood from the uterus.

2. It is unaccompanied by destructive change of epithelium, either in the uterus or Fallopian tubes.
3. It appears to recur once in six weeks in summer; it is, however, difficult to decide the exact length of the menstrual rhythm.
4. In the human female the mucous membrane of the Fallopian tubes undergoes no structural change during menstruation.
5. In the human uterus the destructive change is limited to shedding of the epithelium, and it is doubtful if this occurs normally.

I have had two opportunities of examining the condition of the mucous membrane of the uterus immediately after a menstrual period in women. In each instance I removed the uterus through the vagina and immersed it in Müller's fluid. The parts were embedded and sectioned. Shedding of the epithelium was the only important change.

Heape,* who subsequently interested himself in this question, and enjoyed the opportunity of thoroughly studying simian menstruation in India, particularly as regards the Entellus monkey, *Semnopithecus entellus* (Fig. 8), embodied the results of his investigation in a valuable monograph carefully illustrated. In the Entellus monkey the menstrual rhythm is four weeks, and the manifestation lasts four days. The objective phenomena are similar to those I have described for Macaque monkeys, but not so pronounced. The discharge consists of mucus, leucocytes, blood, stroma, and epithelium. The stroma of the uterine mucosa consists of a network of protoplasm in which nuclei are embedded; no definite cell boundaries are seen. Heape regards the epithelium as a specialised layer of the stroma. The epithelium is shed during menstruation; there is no change in the Fallopian tubes, nor in the mucosa of the cervical canal.

These results bear out in the main my own contention—that the menstrual changes are limited to shedding of the uterine epithelium, and the tubal epithelium takes no part in this extraordinary function.

We must now consider the relation of **ovulation** to menstruation, and the phenomenon known as **œstrus**, or rut.

* Transactions of the Royal Society, 1894.

Many—we may say the majority—think that menstruation and rut are more or less identical. Farre puts the matter very clearly and concisely in the following sentences :—

"In the mammalia the periods of emission of ova from the ovary and of their passage down the Fallopian tube are undoubtedly coincident with œstrus. It is only on these occasions that the female manifests an instinctive desire for copulation. She is then said to be in heat. The vulva is congested, swollen, and bedewed with an increased secretion, which is generally odorous, and is sometimes tinged with blood. This condition is of brief duration. At the longest it continues for a few days. But whatever be its duration, it is the only period during which the female can be impregnated."

"In the human subject the periodical return of congestion of the reproductive organs, the menstrual flow, and the corresponding emission of ova, so far as this point has yet been ascertained by *post-mortem* examination, accord with the phenomena displayed by mammalia during œstrus. It is also believed that in some instances conception has taken place *during* menstruation: a circumstance which is clearly reconcilable with the anatomical evidences already produced, and is so far in accordance with what normally occurs in the mammalia during œstruation. But here the analogy ceases."

Investigations conducted in recent years on the changes in mammalian uteri at the period of rut, and the fact that monkeys menstruate, tend to show that rut and menstruation are more nearly identical than Farre suspected. Since his time our knowledge of the natural history of the human ovary has been rendered more certain by exact observations on this gland, which have been possible in consequence of the advance in abdominal surgery. It is very difficult to uproot a tradition, especially one so ancient as the belief in the intimate association of ovulation and menstruation; but evidence is rapidly accumulating which will show that the two processes are not so intimately connected as was formerly believed.

In the ovary of the human fœtus, ova ripen, form follicles, and undergo suppression during the last month of

intra-uterine life. This has been observed by De Sinéty, Waldeyer, Beigel, and others. I have also assured myself of these facts, and have also detected a similar process in the ovaries of fœtal mammals, including forms as widely separate as kangaroos and lemurs, deer and monkeys, sloths and lions.

The life of the human ovary may be divided into the following periods of activity and repose. The first period extends from the seventh month of intra-uterine life to the end of the first year. Ova ripen in such abundance that in some cases a marked diminution in the number of the ova is appreciable at the second year after birth. To this succeeds a period of comparative repose, terminating at the tenth or twelfth year; then the ripening of ova is again easily detected, and goes on independently of menstruation, even after the accession of the climacteric.

In female monkeys and women ovulation and menstruation are probably independent processes. Maturation of ova from the period of puberty until senility is going on constantly, and the presence of a ripe ovum concurrently with menstruation is a coincidence; in a healthy woman a ripe follicle may generally be found in the ovary between the tenth and fiftieth year, independently of a menstrual period.

The œstrus, rut, or heat of mammals is a term applied to certain objective signs that the female will receive the male, and is usually associated with ovulation.

Ovulation signifies the escape of mature ova from the ovary.

Although these three processes may occur independently of each other, still we cannot but doubt that they are physiologically associated; and it is a fact beyond dispute that if the ovaries and Fallopian tubes be removed from a woman who has menstruated with the greatest regularity for years, and is still in the bloom of sexual life, we may predict with almost absolute certainty that menstruation will cease.

The removal of the ovaries and tubes, with the adjacent portions of the mesometrium, has now been performed in women for diseases of the ovaries or tubes many hundreds of times, with the almost invariable result of immediately and permanently arresting menstruation. In many cases, as we shall find later, these parts are removed in some forms of

uterine tumour for the purpose of producing an artificial menopause. Lawson Tait* is disposed to believe that the tubes are not without some influence on menstruation. Instances in which the ovaries have been removed and the tubes allowed to remain, or cases in which the tubes were removed and the ovaries left behind, are very few; but sufficient cases have been recorded to render it absolutely certain that the dominant organs of the menstrual function are the ovaries. It is necessary to use the plural, because extirpation of one ovary exercises no influence on menstruation. In a few cases it is believed that menstruation has continued or reappeared even after complete removal of both ovaries and tubes. This subject is of so much interest and importance that a full discussion of the evidence relating to it will be deferred to chapter liv. This much, however, is certain: that the subjoined opinion expressed by Farre in 1859 relative to the influence of the ovaries on menstruation—"Their artificial removal is followed by a permanent cessation of the catamenial flow, although the uterus may be left uninjured; while the congenital absence of both ovaries is always accompanied by an enduring amenorrhœa"—holds good in the present day, *and the cause of menstruation remains as obscure as ever.*

* "Diseases of the Ovaries," p. 25, 1883.

CHAPTER III.

THE CORPUS LUTEUM. OVARIAN APOPLEXY AND OVARIAN CONCRETIONS.

When the contents of a mature follicle are discharged, the cavity of the follicle becomes filled with blood as a consequence of its rupture; then its periphery is gradually occupied by reddish-yellow tissue and forms a body termed the **corpus luteum.** Should the ovum become fertilised, the corpus luteum increases in size and persists as a conspicuous object in the ovary throughout the whole period of gestation. In an unimpregnated female the corpus luteum begins to degenerate within ten or fourteen days after the escape of the ovum, and finally disappears.

No satisfactory explanation is forthcoming regarding the cause of a corpus luteum. Dr. Ritchie (the elder) pointed out that the mere rupture of an ovarian follicle is insufficient to produce a corpus luteum, and he attempted to show that its formation depended on menstruation. This is not the case, as corpora lutea occur independently of this process in the ovaries of girls before puberty.

It should be borne in mind that a corpus luteum is not always present in pregnancy. To put it in the words of Parry:* "Its presence is the rule, its absence is the exception, especially in the early months of gestation." Dr. Popow† twice found true corpora lutea unassociated with pregnancy. In the ovary of a prostitute, twenty-one years of age, who committed suicide by prussic acid, he found "a fully ripe corpus luteum." The woman was neither menstruating nor pregnant.

The second case was a woman forty-one years of age, who had not borne children for twelve years. She died from gangrene of a fibro-myoma of the cervical canal. The right ovary contained a true corpus luteum.

Matthews Duncan, in his remarks on this paper, said: "He had seen a good corpus luteum, as far as naked-eye

* "Ectopic Pregnancy."

† Trans. Obstet. Soc. London, vol. xxiv. p. 100.

appearances went, in an aged woman who was believed to be salacious. He had more than once dissected cases of pregnancy, with complete absence of the corpus luteum."

The two largest corpora lutea that have come under my observation were in ovaries removed for the purpose of anticipating the menopause in cases of rapidly-growing uterine myomata. The patients' ages were forty and forty-five years respectively. One had never been pregnant, and the other had had no child for ten years.

A very large corpus luteum, which would pass well as a corpus luteum of pregnancy, is represented in Fig. 10. The ovary in this case is occupied by a dermoid. The patient was between thirty and forty years of age, single, and had never been pregnant. Her uterus was occupied by a myoma which was large enough to rise above the brim of the true pelvis.

It is a fact to bear in mind that some of the largest corpora lutea which come under observation are associated with tubal pregnancy (Fig. 115).

Secondary Changes.—Corpora lutea are liable to the following changes:—

(1) They may be converted into cysts.

(2) They may become corpora fibrosa.

(3) Or undergo calcification.

Cystic Corpora Lutea.—Rokitansky long ago observed that these bodies are occasionally occupied by a central cavity; and he held the opinion that they might enlarge and form tumours of sufficient size to become clinically important.

Most observers who have worked at ovarian pathology have detected examples of this form of cyst; the peculiar yellow colour of the walls enables them to be readily recognised.

I have devoted much time to examining ovaries in the human subject, for the express purpose of ascertaining if cysts in corpora lutea ever give rise to tumours which could be perceived during life; and though I have on several occasions met with such cysts, which formed prominences on the surface of an ovary as large as ripe cherries, they never caused any inconvenience to the individual who possessed them.

In domestic mammals—the cow, ewe, mare, and sow—they are extremely common; in the cow they may attain the size of a Tangerine orange.

In all cases the walls of such cysts are thick, and of a bright yellow colour, when fresh; the cavity is lined by a thin delicate membrane, and filled with albuminous fluid.

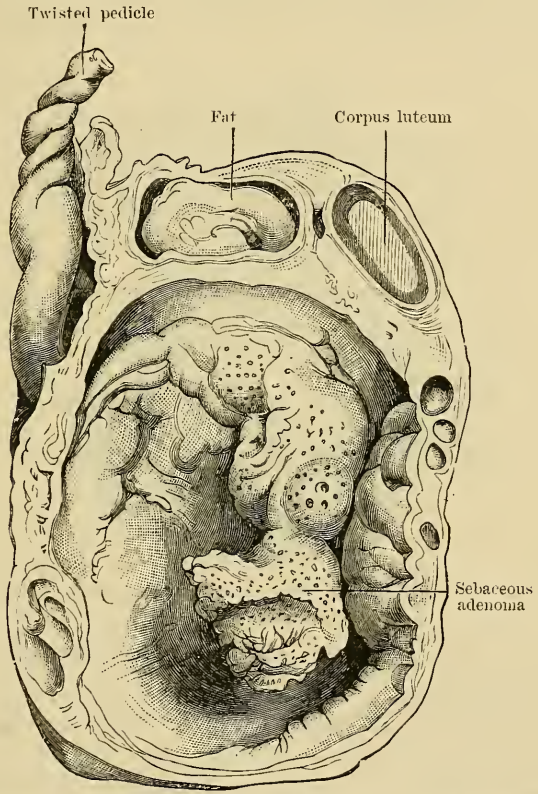

Fig. 10.—Ovarian Dermoid with a large Corpus Luteum. From a single woman who had never been pregnant.

Corpora Fibrosa.—Patenko* has described, under this term, the tough, semi-opaque fibrous bodies occasionally found in ovaries. They are probably due to fibrous changes

* Virchow's *Archiv*, vol. xxxiv. p. 193: "Ueber die Entwicklung der Corpora Fibrosa in Ovarien."

in the tissue of corpora lutea. Some corpora fibrosa contain a small central cavity, others a laminated body, due to secondary change in the central parts of the corpus luteum.

Patenko states that corpora fibrosa may attain the size of a hen's egg; they are sometimes pedunculated. These bodies are by no means rare in the ovaries of women over forty years of age. Occasionally they become calcified (Fig. 11): in this respect they resemble "fibroids" of the uterus.

Fig. 11.—Portion of a Fallopian Tube and Ovary with a calcified Corpus Fibrosum.

Calcified Corpora Lutea.—When calcified a corpus luteum may be irregular in shape, or rounded; it usually exhibits a bright yellow colour when fresh, and consists of tough fibrous tissue impregnated with calcareous particles.

These bodies are usually firmly embedded in the ovarian stroma; in one instance the concretion was nodulated on its outer surface like a mulberry calculus, and lodged in a cyst in the substance of the ovary (Fig. 12). Two calcified corpora lutea may be present in one ovary; they must not be confounded with calcified corpora fibrosa.

When my attention was first attracted to these bodies, Mr. Meredith kindly placed in my hands an ovarian cyst the size of a duck's egg, with a hard yellow body the size of a lady's

thimble in its wall. It was a calcified corpus luteum. This body could be felt on bimanual examination, and gave rise to much speculation as to its nature before operation.*

Apoplexy of the Ovary.—The rupture of a mature ovarian follicle is always accompanied by a trifling amount of bleeding. When the follicle is unusually large, the blood-clot occupying it may be as big as a ripe gooseberry. Hæmorrhage, to this extent, is often associated with severe ovarian

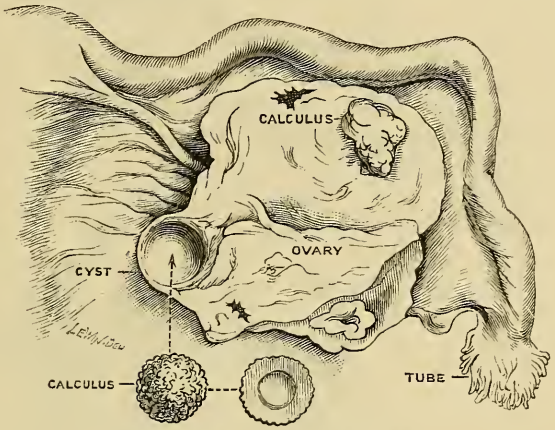

Fig. 12.—Calcified Corpora Lutea.

congestion, such as accompanies tubal pregnancy, miscarriage, or uterine tumour.

Mild hæmorrhage of this character is, by some authors, called ovarian apoplexy, but it would be preferable to describe such a condition as **follicular hæmorrhage,** in order to avoid confounding it with the much more serious form of ovarian hæmorrhage now to be considered.

Occasionally blood is extravasated so freely into a follicle that it bursts the walls and invades the stroma, converting the organ into a spurious cyst the walls of which are formed of expanded ovarian tissue, and the cavity filled with blood.

For such conditions the term ovarian apoplexy should

* *See* author, *American Journal of Obstet.*, vol. xxvii. p. 908; Whitridge Williams, *ibid.*, vol. xxviii. p. 1; Hannah T. Croasdale, *ibid.*, vol. xxviii. p. 359.

be reserved, which, with Doran,* may be defined as *hæmorrhage into the ovarian stroma through rupture of a follicle* (Fig. 13).

The effects depend upon the amount of hæmorrhage. The ovary may become distended until it is as large as a

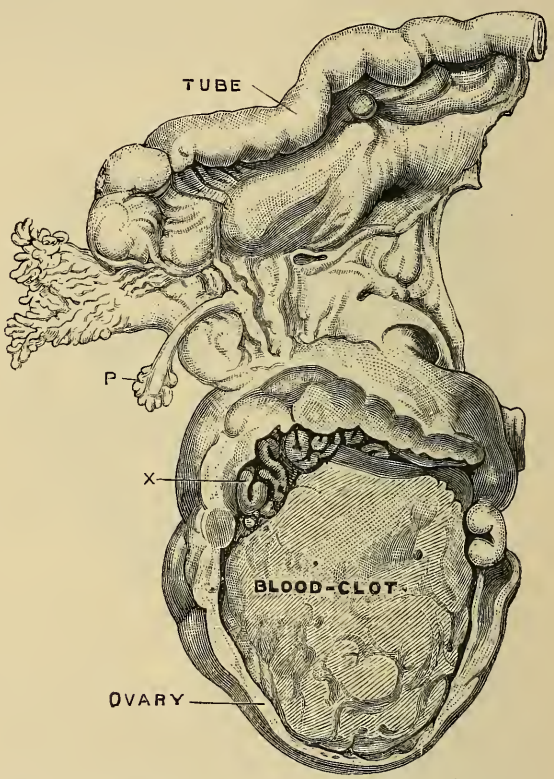

Fig. 13.—Apoplexy of the Ovary. (Modified from *Doran*.)
P, Fimbriated Kobelt's tube; X, crumpled remains of the wall of the follicle whence the hæmorrhage proceeded.

billiard-ball: such cases are very rare. Dr. Handfield-Jones † removed an ovary the size of an orange from a woman who suffered from profuse and exhausting menorrhagia. The hæmorrhage, which had started a year previously, after a

* Trans. Obstet. Soc. London, vol. xxxii. p. 119. This valuable paper is founded on a case of great clinical interest.

† *Ibid.*, vol. xxxiii. p. 27.

serious railway injury, had reduced the patient to a condition of profound anæmia and debility. The loculi of the diseased ovary were filled with liquid blood in varying stages of decomposition. After the operation the patient rapidly improved, and the metrorrhagia ceased. Dr. Macnaughton-Jones* met with a similar case; at the operation the parts surrounding the left ovary were matted together, and, after much trouble, the ovary, enlarged to the size of an orange, was removed. It contained a cavity full of blood.

It is important to distinguish between hæmorrhage into the stroma of the ovary or bleeding into a small ovarian cyst.

Blood extravasated into the ovarian stroma undergoes the same change as when it escapes into other solid organs: that is, the fluid parts are absorbed and the clot gradually becomes decolorised, until nothing but a yellowish mass of fibrin remains. Occasionally it will be of a dirty-brown colour, resembling that found in an old hæmatocele of the tunica vaginalis testis.

An examination of three ovaries forwarded to me as examples of ovarian apoplexy showed that the bleeding was due to engorgement, the consequence of axial rotation of the ovary.

Ovarian Concretions.—A rare instance of concretions occurring in the ovary is recorded by Dr. H. W. G. Mackenzie.† The patient was forty-one years of age, and had suffered for two years from menorrhagia; she had a large myoma of the uterus. The ovaries were enlarged and contained a number of black, hard, flat bodies. The cavities containing them were smooth-walled. The concretions were of various sizes, from a coriander-seed to a small bean, and of irregular shape, but their surfaces were smooth and flattened where they had come in contact with one another (Fig. 14). They were firm and hard, but light, and could be cut with a knife like very hard wax. Sections prepared from the concretions exhibited no structure, but there were indications that the mass consisted of spheroidal bodies.

Dr. Copeman attempted to determine their chemical

* "Diseases of Women," 6th edition, p. 507.

† Trans. Path. Soc. London, vol. xl. p. 198.

constitution. They were insoluble in acid and alkaline solutions, in ether and chloroform. Prolonged digestion with artificial gastric juice in an incubator at the body temperature dissolved them. The coloured solution thus obtained gave the spectrum of acid hæmatin and the guaiacum reaction for blood.

The concretions probably consisted of coagulated proteids

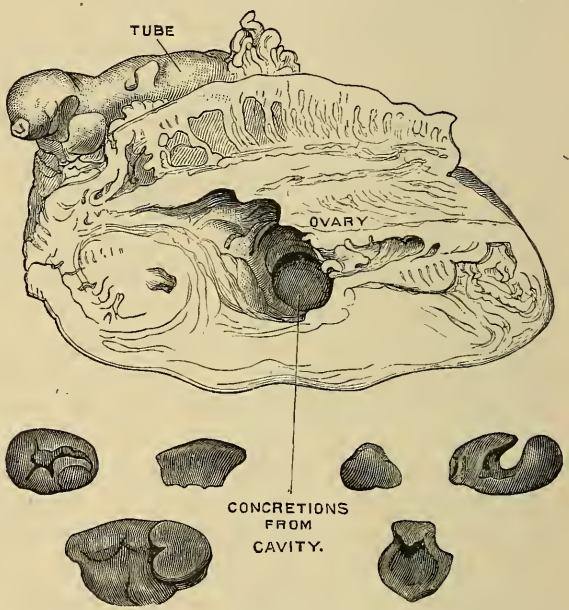

Fig. 14.—Ovary with Cyst containing Concretions. (Museum, St. Thomas's Hospital.)

derived from blood-clot, akin to lardacein, and of the same family as the concretions of the prostate and the amyloid bodies sometimes found in old hæmorrhages.

It is probable that the cavities which contained the concretions were ovarian follicles, and that blood had been effused into them and undergone a rare colloid change.

It is not unusual to find hard clots of blood in ovarian follicles, but concretions of the density exhibited in this specimen are excessively rare.

CHAPTER IV.

ABNORMALITIES OF THE OVARIES: OVARIAN PREGNANCY.

THE ovaries, like other organs of the body, are liable to malformations and misplacements, some of which possess a practical interest.

Congenital absence of both ovaries is very rare, and is always associated with defective development of the uterus. Absence of one ovary has been several times recorded, with deficiency of the corresponding half of the uterus and the Fallopian tube. In a fair proportion of cases there is absence of the corresponding kidney.

A third or accessory ovary has been mentioned by a few writers. Several conditions have been described as third ovaries. An ovary is sometimes traversed by a fissure so deep as almost to isolate a portion of the gland; under these conditions it seems to consist of two parts united by a narrow isthmus. It is stated that the ovary may be so deeply fissured that it appears as if composed of lobules. Olshausen* has collected many reported cases of supernumerary ovaries, and refers to those described by Beigel and Winckel. I have examined the drawings in Winckel's work, and find that he gives figures of ovaries with small pedunculated bodies attached to them; but these are not in any sense supernumerary ovaries. Indeed, the statement that Winckel found accessory ovaries eighteen times in 500 bodies, and that Beigel found them eight times in 350 bodies, is sufficient to indicate that these writers must have regarded any pedunculated body near the ovary as an additional ovary. The descriptions of some of the cases render it exceedingly probable that some of them were the pedunculated bodies so frequently found near, and in relation with, the parovarium. A few were probably corpora fibrosa, and some probably small fibro-myomata of the ovarian ligament (Doran). So far as the evidence at present stands, an accessory ovary quite

* "Krankheiten der Ovarien," p. 15, 1886.

separate from the main gland, so as to form a distinct organ, has yet to be described by a competent observer.

Alterations in Shape of Ovary at different Periods of Life.—The variations in the shape of the ovary from infancy to old age are very marked. In the fœtus at birth the ovary is

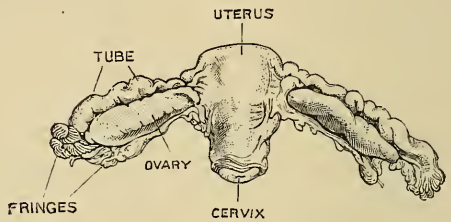

Fig. 15.—Uterus, Tubes, and Ovaries of an Infant one month old. Natural size.

an elongated body, resembling in shape a miniature but somewhat flattened cucumber, lying parallel with the Fallopian tube; not infrequently its borders are crenated, and sometimes a longitudinal furrow is present on its free surface. The ovary of an infant a month old is represented of natural size in Fig. 15.

The infantile form of ovary gradually changes, and at puberty it has become transformed into the characteristic olive-shaped gland indicative of the sexually mature female. From the accession of puberty until the forty-fifth year the general contour of the ovary remains undisturbed, but the smoothness of the surface is marred by scars, the effects of repeated lacerations, caused by the rupture of mature follicles. In rare instances the infantile shape of the ovary may be retained, especially in the malformation known as *unicorn uterus*. In this condition one-half the uterus, with the tube and ovary, proceeds to full development, but the opposite half remains stunted, or rudimentary. (*See* chap. xxxviii.)

From the age of forty-five onwards the ovary diminishes in size. This alteration is accompanied by arrest of menstruation. As the organ shrinks its surface becomes irregular, and often marked with deep wrinkles. At the same time profound alterations are taking place within the gland, for the ova and ovarian follicles gradually disappear, until, in very advanced

life, nothing is left but a corrugated body, consisting of fibrous tissue, traversed by a few blood-vessels (Fig. 16).

The alteration in the size of the organ may be best expressed by giving the difference in weight. The ovary of a healthy woman of twenty weighs, on an average, 6 grammes (90 grs.); in an old woman of seventy years it may weigh only 1 gramme (15 grs.).

The uterus and Fallopian tubes undergo a corresponding diminution in size, and the mucous membrane atrophies.

Atrophy of the Ovary.—The senile changes just described may be regarded as physiological atrophy; when they occur at an early period in the sexual life of a woman they are then described as pathological. Our knowledge of premature atrophy of the ovary is not very precise, and reliable accounts

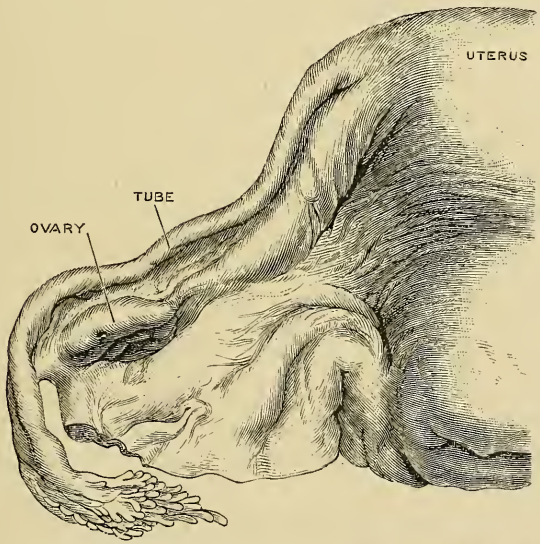

Fig. 16.—Ovary and Tube of a Woman sixty-eight years of age. Natural size.

of the microscopic appearances of atrophied ovaries are very few.

It is a fact of some clinical interest that the premature atrophy of the structures around the vulva—the labia majora and minora—known to gynæcologists as **kraurosis vulvæ** is

associated with atrophy of the uterus, Fallopian tubes, and ovaries.

Abnormalities of Position.—In the embryo the ovaries, like the testicles, are in close relation with the kidneys. In the majority of vertebrates they maintain this position throughout life. In a few of the higher mammals, including the human female, they migrate into the pelvis, and at birth lie on the psoas magnus muscle. Soon after birth the ovaries occupy a position in the true pelvis near its brim, until disturbed by the first pregnancy, or by disease.

In very rare instances an ovary may be retained in relation with the kidney. An example of this came under my observation in a fœtus. The genital organs were well developed, but the right ovary was adherent to the lower border of the corresponding kidney; the cæcum remained in the right hypochondrium, adherent to the under surface of the liver. It is well known that in a certain proportion of cases of non-descent of the right testis the cæcum also fails to descend into its natural position in the right iliac fossa. It is of some interest to find retention of the right ovary in the loin associated with the same disposition of the cæcum.

Retention of the ovary between the kidney and its natural position in the true pelvis is extremely rare. My experience of this abnormality is limited to one case.*

The patient was a girl nineteen years of age. An elongated body could be easily felt in the left iliac fossa situated over the brim of the pelvis. This body was firm, but pressure upon it caused pain. It was exposed through an incision in the anterior wall of the belly, and found to be an ovary fixed at the brim of the pelvis. It was 6 cm. in length, elongated, and in shape like a cucumber, the long axis lying along the ureter; its lower third dipped into the pelvis. The Fallopian tube was on its outer side. The ovary and tube were removed. They were examined microscopically, and found to be natural in structure. The right ovary was natural in shape, size, and position. It is clear that the ovary had retained its infantile shape. The uterus was normal.

Hernia of the Ovary (Oöphorocele).—The ovary, like other abdominal viscera, may occupy hernial sacs either alone

* *Medical Press and Circular*, 1894, vol. i. p. 542.

or in company with the Fallopian tube, omentum, intestine, etc.; it may occupy a hernial sac in the inguinal or femoral regions; rarely an obturator, and very rarely an umbilical sac. Following the method adopted with other varieties of hernia, when the ovary occupies a hernial sac alone it may be styled an **oöphorocele**; if accompanied by the tube, a **salpingo-oöphorocele.** Hernia of the tube alone would be a **salpingocele.**

Congenital Oöphorocele.—It is curious, notwithstanding the fact that the inguinal canal in female children is occupied by a peritoneal pouch, the canal of Nuck, congenital oöphorocele or salpingo-oöphorocele is very rare, so rare indeed that I have not succeeded in finding an authentic case. Many writers on hernia mention congenital hernia of the ovary as if it were common; but it must be remembered that many of the movable rounded bodies so frequent in the inguinal canals of female infants are in most cases hydroceles of the canal of Nuck (funicular pouch). They require no treatment, and invariably disappear.

Cases reported as congenital hernia of the ovary may be found, the nature of the gland being determined by the naked eye; there is no example on record in which the structure of such a body was examined microscopically and found to be an ovary. That this precaution is absolutely necessary to establish the fact is shown by cases in which herniated bodies, supposed to be ovaries, were found on microscopical examination to be testes. Of this a remarkable example was recorded by Dr. Chambers.* An individual, supposed to be a woman, aged twenty-four years, had observed swellings in the groin as long as she could remember. She had never menstruated; her breasts were well developed, but nippleless. The mons Veneris was destitute of hair, the clitoris and labia were small, and the vagina ended in a cul-de-sac 2·5 cm. deep. As the inguinal swellings caused the patient much inconvenience and pain, they were removed. They were shown to the Obstetrical Society, London, as ovaries. They were subsequently examined by Sir John Williams and Dr. Galabin, who reported that the supposed ovaries exhibited the microscopic characters of testicles.

* Trans. Obstet. Soc. London, vol. xxi. p. 256.

During 1895 a woman forty-seven years old was admitted into the Infirmary, Newcastle-on-Tyne, under the care of Dr. Arnison, on account of an irreducible right inguinal hernia. When the sac was opened, a body supposed to be an ovary was removed; but when examined microscopically, it was found to be a testis. The external genitals were typically female, and a rounded body was detected in the left inguinal region. The mammæ were rudimentary, and like those of a boy. The hair on the scalp was long, the face hairless, the voice feminine, and menstruation absent. She had sexual regard for the male, and once had a lover: but as she had never menstruated, she regarded herself as non-nubile. I had an opportunity of examining this individual, and of investigating sections of the testes.

By one of those strange coincidences so common in the practice of surgery, a precisely similar individual came under Mr. Frederick Page's care a few weeks later in the same infirmary. In this case the herniated bodies were not removed; hence their testicular nature lacks absolute demonstration. Mr. Page afforded me an opportunity of examining the patient.

It is also important to bear in mind that when organs supposed to be ovaries occupy the inguinal canals, and subsequent dissection of the individual discloses the existence of a uterus, it is no reason for assuming that the genital glands were ovaries.

Whilst dissecting the body of a male fœtus, born at the eighth month, I found a uterus of the normal size and shape behind the bladder, and communicating by means of a small vagina with the urethra in the situation of the sinus pocularis. The Fallopian tubes passed from the uterus as mere threads until they approached the inguinal canals, then each expanded to form a fringed ampulla in relation with an oval body of the size of a fœtal testicle lying just below the internal ring. The microscope showed each of these bodies to be testicles. Franck has recorded a similar persistence of the peritoneal extremity of the Fallopian tube in relation with a normally formed testicle in a foal.

Many similar cases could be quoted, if necessary. For a well-recorded case of this kind, *see* Stonham * (Fig. 17).

* Trans. Path. Soc., vol. xxxix. p. 219.

I do not deny that an ovary may occupy the inguinal canal at birth; but no such case has, so far as I know, been recorded in which the ovarian nature of the herniated body has been proved by microscopic examination, conducted by a competent observer.

Acquired Hernia of the Ovary.—This may occur at any age; it has been observed as early as the third month, and as late as the seventy-fifth year. A strangulated oöphorocele

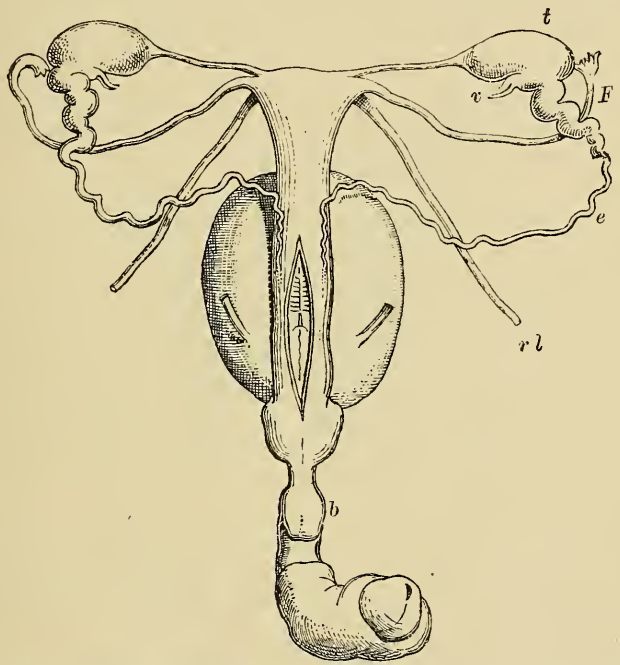

Fig. 17.—Genital Organs of a Pseudo-Hermaphrodite. (After *Stonham.*)
e, Vas deferens; *t*, testis; F, Fallopian tube; *b*, bulb; *v*, vessels; *r l*, round ligament.

or salpingo-oöphorocele gives rise to symptoms such as are met with in strangulated epiploceles or enteroceles, and I know of no means of distinguishing them. It is also possible that in some of the cases the signs of strangulation were produced by rotation of the ovary. It is a fact that when a testis retained in the inguinal canal undergoes axial rotation, the symptoms are often confounded with those of strangulated hernia, as Gifford Nash * has well shown.

* St. Barth. Hosp. Reports, vol. xxix. p. 163.

Femoral.—Maylard* successfully operated on a woman seventy-five years of age for strangulated femoral hernia: an ovary alone occupied the sac. The gland was demonstrated to be the ovary by microscopic examination.

Inguinal.—In 1881, whilst acting as dresser to Mr. J. W. Hulke, this surgeon removed from a woman twenty years of age an ovary and portion of the tube from the right inguinal canal. The swelling had existed six weeks. I demonstrated the ovarian nature of the gland microscopically. The left ovary was removed by Dr. Heywood Smith four years later.

Dr. Robert Barnes† mentions an instance of inguinal hernia of the ovary in a woman forty-one years of age. Its ovarian character was substantiated microscopically by Dr. Goodhart.

Bilton Pollard‡ excised an acutely strangulated ovary and a portion of the Fallopian tube from the inguinal canal of a child three months old.

Leopold Hudson§ found both ovaries and Fallopian tubes and the fundus of the uterus with a small knuckle of gut in the sac of a right inguinal hernia. The patient was nine weeks old, and the mother had noticed the swelling a month previously. Several cases have been recorded in which a pregnant uterus and its appendages have occupied the sac of an inguinal hernia.

Obturator.—Rogner-Gussenthal|| has described and figured the pelvis of a woman sixty-six years old whose ovary, part of the tube, and broad ligament were found herniated through the obturator foramen.

Umbilical.—Solovieff¶ found a cystic ovary in the sac of an umbilical hernia; the patient was sixty-seven years of age.

Ventral.—The pregnant uterus with the ovaries and Fallopian tubes have several times been found in the sac formed by the yielding of the cicatrix after cœliotomy. (*See* chapter xliii.)

* *Brit. Med. Journal*, 1892, vol. i. p. 761. *See also* Owen, *ibid.*, 1873, vol. ii. p. 690.

† *American Journal of Obstet.*, vol. xvi. p. 11.

‡ *Lancet*, 1889, vol. ii. p. 165.

§ *Med. Press and Circular*, 1895, vol. ii. p. 186.

|| *Wiener Med. Presse*, 1893, No. 26, s. 1011.

¶ *Annales de Gynec. et d'Obstet.*, 1894, t. xlii. p. 210.

Salpingocele.—Hernia of the Fallopian tube alone is very unusual. Salpingoceles may occur in the inguinal (Fig. 18) or femoral canal; according to Léjars,* the femoral is more frequent than the inguinal variety, and the condition is extremely rare before the thirtieth year of life. The tube is occasionally found in hernial sacs associated with bowel, omentum or bladder, and it is often the companion of a herniated ovary, as has already been mentioned. Dr. von Tischendorf reported a case to the Leipzig Obstetrical Society,

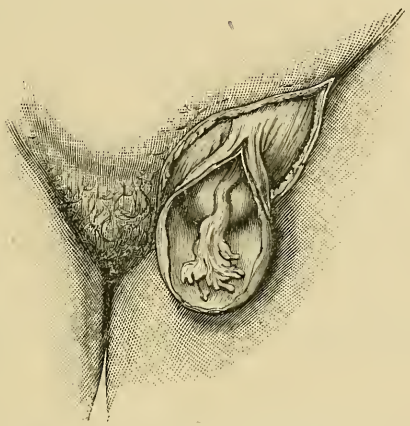

Fig. 18.—Salpingocele. (After *Léjars.*)

in which an elderly woman came under observation with the signs of strangulated femoral hernia. The sac was found to contain the left Fallopian tube.

Bilton Pollard † opened a swelling in the left groin of a woman thirty-seven years of age, mother of eleven children; the swelling gave all the signs of a strangulated femoral hernia. On opening the sac it was found to contain the swollen fimbriated end of the Fallopian tube.

Treatment.—Herniated ovaries and tubes require removal when they are a source of pain, and in women who cannot wear a truss. This procedure has been almost entirely confined to those who have to maintain themselves by hard work. The operation is performed as for inguinal hernia,

* *Revue de Chirurgie*, 1893. † University College Hospital Reports, 1889.

the ligatured stump should be returned into the abdominal cavity, the sac dissected out, and its neck transfixed and secured with reliable catgut. When herniated ovaries or tubes become strangulated or undergo axial rotation (torsion), operation is the only choice, as the urgent symptoms are rarely likely to be differentiated from those which arise from strangulation of herniated intestine.

Prolapse of the Ovary.—In describing the situation of the normal ovaries it was pointed out that in the adult female they are situated in the true pelvis, near its brim, until disturbed by the first pregnancy or by disease. From this position they may be displaced by three sets of causes, each of which will be briefly considered.

1. *Pregnancy.*—The alteration in the size of the uterus during pregnancy, and the stretching to which the pelvic peritoneum, Fallopian tubes, and ovarian ligaments are subjected, causes them, especially if pregnancy be frequently repeated, to become very lax. Under these conditions, one or other ovary, instead of retaining its usual position at the brim of the true pelvis, may drop upon or near the floor of the recto-vaginal pouch. When the left ovary is thus displaced it lies between the upper part of the vagina and the rectum.

An ovary thus displaced is said to be prolapsed, and not infrequently is a source of much pain and distress, for it becomes pressed upon during defæcation, and patients complain of the severe pain they then experience. Intense pain during sexual congress (dyspareunia) is another symptom, and many women with displaced ovaries will state that the approach of their husbands is to them a source of constant dread. On examining such patients a small elongated, movable body will be felt behind the neck of the uterus. Each time the finger touches it the patient winces and complains of pain. These painful sensations are most acute when the ovary itself is touched, but they are also evoked when the neck of the uterus is pressed, because the ovary is then squeezed between the uterus and rectum.

2. *Retroflexion of the Uterus.*—When the uterus is acutely retroflexed the ovaries become displaced and sometimes fixed to the floor of the recto-vaginal pouch by adhesions.

3. *Enlarged Ovaries.*—When an ovary is enlarged in consequence of a solid or cystic tumour of moderate dimensions, its weight will cause it to fall upon the floor of the recto-vaginal pouch; the presence of a small parovarian cyst will produce a similar displacement.

The clinical bearing of displacements of the ovary from various causes will require careful consideration in subsequent sections of this book.

Ovarian Pregnancy.—The belief that an ovum may be fertilised in its follicle and engraft itself upon the ovarian tissues and develop into a fœtus has no foundation in fact. Many cases, formerly described as examples of ovarian pregnancies, turn out, on critical examination, to be ovarian dermoids, or partially calcified fœtuses the result of tubal pregnancy sequestered in the mesometrium (broad ligament). The modern cases rest upon no safer evidence than the non-detection of the ovary during an operation upon, or the *post-mortem* examination of, a subject of advanced tubal pregnancy.

Until a specimen is forthcoming with an early embryo, and its membranes contained in a sac inside the ovary, we need not trouble to discuss ovarian pregnancy.

CHAPTER V.

INFECTIVE (INFLAMMATORY) DISEASES OF THE OVARIES.

INFLAMMATION of the ovary, acute and chronic, is so constantly associated with salpingitis, and in nearly all cases is secondary to it, that the chief points in the pathology, diagnosis and treatment of the affection will be dealt with in the section devoted to salpingitis.

It will be convenient to mention here that dysmenorrhœa is sometimes associated with a tender swelling on each side of the uterus. These swellings are often regarded as inflamed ovaries. It is much more probable that they are Fallopian tubes swollen as a result of catarrhal conditions of the mucous membrane. As the inflammation subsides, the swelling, pain and tenderness vanish.

The pain experienced by these patients may be explained on the same principle as that met with in relapsing appendicitis. The tumefaction of the mucous membrane temporarily obstructs the communication between the appendix and the cæcum; this leads to distension of the appendix, in consequence of the accumulation of mucus furnished by the glands, and, in some cases, inflammatory products. The distension of an obstructed appendix causes pain. As soon as the inflammation subsides sufficiently to allow the blockade to be raised, tension is relieved by the escape of the retained fluid into the cæcum.

Actual observation supports the view that distension of an occluded mucous canal is often accompanied by intense pain and tenderness. My clinical and pathological inquiries have led me to the conclusion that many cases diagnosed as oöphoritis are really instances of catarrhal salpingitis.

There are two varieties of oöphoritis, apart from septic inflammation, conveyed through the tube which require separate consideration:—(1) Oöphoritis secondary to parotitis (mumps), and (2) tuberculosis of the ovary.

1. **Oöphoritis and Mumps.**—Girls and young women, during an attack of mumps, occasionally complain of pelvic pain. In a few cases, where the suffering has been sufficiently severe to warrant a vaginal examination, the ovaries have been found enlarged, tender and painful. As a rule, the ovaries are affected during the subsidence of mumps. In a few exceptional cases the pelvic pain has preceded the parotid signs.

In this connection it is important to bear in mind that parotitis is not infrequently a sequel to injuries or operations upon abdominal, and especially pelvic, viscera. (*See* chapter xlii.)

At present there is no explanation forthcoming of the relation of oöphoritis and orchitis as sequelæ of mumps. Indeed, the whole of the evidence rests on clinical observation.

2. **Tuberculous Infection of the Ovary.**—This affection occurs either as small miliary nodules limited to the surface of the ovary, or as caseous masses in its substance.

The first variety is the commoner, and in probably all cases occurs as part of a general tuberculosis; it is usually associated with tubercle of the peritoneum.

So far as can at present be judged from the records of specimens furnished by competent observers, the caseous nodules in the ovary usually form part of a general infection, and at present there is no trustworthy evidence that the ovary is affected primarily with tuberculosis. In many of the specimens of ovarian tuberculosis of both forms the Fallopian tubes were affected.

Abscess of the Ovary.—Suppuration in the ovary is, in the great majority of instances, secondary to salpingitis. Abscess of the ovary, apart from tubal infection, may occur in patients with tuberculous lesions in other organs. The patient from whom the ovary in Fig. 19 was removed subsequently died from pulmonary tuberculosis.

A very rare cause of abscess in the ovary is a foreign body. Haviland * removed a suppurating ovary from a woman twenty-one years old. On examining it a piece of a sewing-needle 2 cm. long was found in the abscess cavity.

The pathology, clinical features, and treatment of ovarian

* *New York Medical Record*, 1892, Oct., p. 398.

abscess is so intimately associated with pyosalpinx and its complications that its consideration will be deferred to Section II.

Perioöphoritis.—Chronic inflammation of the peritoneum in the immediate neighbourhood of the ovary is almost certain to involve the surface of this gland. Thus, after salpingitis, pelvic peritonitis, and pelvic cellulitis, the superficial parts of the ovary are involved in adhesions, and

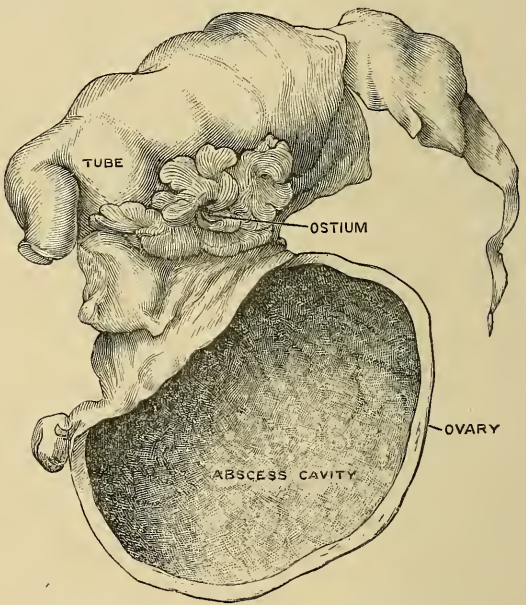

Fig. 19.—Tuberculous Abscess of the Ovary.

become bound to the Fallopian tube, mesometrium, rectum, vermiform appendix, or small intestine.

In the very late stages of salpingitis, when the tube becomes sclerosed, the ovary becomes similarly changed. Its superficial parts are converted into tissue as dense as that of a cicatrix, and as it contracts the stroma dwindles, and the follicles in many instances are completely effaced.

These changes, in a measure, explain the pain so often experienced by young women in the course of chronic salpingitis. When the follicles mature, their enlargement is

interfered with by this dense covering, and the tension probably produces suffering. This, however, is not the only source of pain, for it occasionally continues after the ovaries have been removed.

Perioöphoritis is said to occur as a sequel to typhoid fever, rheumatism, the exanthemata, and chronic alcoholism. It is frequently seen as a consequence of ascites.

The chief results of perioöphoritis are painful menstruation (dysmenorrhœa) and sterility.

Cirrhosis.—Ovaries are occasionally met with in women between twenty and forty years of age, presenting a peculiar wrinkled appearance. Such ovaries are said to be cirrhotic, because the ultimate effect on the proper tissue of the ovary is similar to that seen in hepatic, renal, and pulmonary cirrhosis—that is, to destroy the proper tissue of the liver, kidney, or lung, as the case may be. The great difference in fibrosis of the ovary as compared with this change in other organs is, that in the ovary the connective tissue of the stroma shows no evidence of inflammation. In cirrhotic livers the interstitial tissue is infiltrated with small round cells, but in cirrhotic (or fibroid) ovaries this is not the case even when this change occurs in the ovaries of women who also have cirrhotic livers.

The changes described as cirrhosis, or fibrosis of the ovaries, occurring in women between twenty and forty years of age, require investigation. Even the cause or causes producing the change are imperfectly understood.

Treatment.—The management of patients with ovarian troubles, which clinically are ranked under the heading cirrhosis and perioöphoritis, are the despair of the practitioner. The patients themselves form two groups:—

(*a*) Extremely neurotic women, usually single, between the ages of twenty and thirty-five.

(*b*) Married women, some of whom have had children, but the majority are sterile; but nearly all possess the disastrous failing of being "sly drinkers," usually spirit-drinkers. A few are addicted to morphia.

In the class (*a*) drugs are useless, and the removal of the ovaries, which has been recommended and even practised in these cases, only disappoints the patient's friends and the

practitioner. (*See* chapter xxix.) Many speedily recover when happily mated.

The women of class (*b*) are as little benefited by treatment as individuals with advanced malignant disease. Many find their way into lunatic asylums, and some figure in the divorce court, but not till they have wrecked their homes and become a source of incessant worry to their families.

CHAPTER VI.

TUMOURS OF THE OVARY.

The ovary is liable to the following genera of tumours:—(1) Fibromata; (2) Myomata; (3) Sarcomata; (4) Carcinomata; (5) Adenomata; (6) Dermoids; (7) Cysts.

Fibromata.—Tumours composed entirely of firm fibrous tissue have been observed; some examples have been so large as to weigh 5 kilogrammes. Ovarian fibromata are very rare; many specimens described as such have turned out on careful re-examination to be typical spindle-celled sarcomata. It is very difficult to obtain reliable and complete records of a sufficient number of cases to enable a satisfactory description of the clinical aspects of ovarian fibromata to be written.

The histories of patients subsequent to operation are of the greatest importance. In 1884 Knowsley Thornton* removed a large ovarian fibroma from a woman twenty years of age. The pedicle was long and narrow, and the relation of the tube and mesometrium proved clearly that the tumour was ovarian. The uterus was healthy, the opposite ovary small and infantile.

She married at the age of fifteen, but had never borne children. Previous to the operation sexual desire appears to have been absent. After recovery the instinct rapidly developed: the patient left her husband and bore a child to another man. Ultimately she returned to her home, and in 1888 was in good health.

One of the greatest difficulties in connection with our knowledge of the solid tumours of the ovaries is due to the eagerness on the part of operators to record successful operations, but they do not display sufficient zeal to follow up and report the subsequent histories of their patients.

The complete histories of a score of such patients would be very valuable.

* *See* Doran, Trans. Obstet. Soc., vol. xxx. p. 426: "On Myoma and Fibromyoma of the Uterus and Allied Tumours of the Ovary."

Myomata.—Tumours of the ovary composed mainly of unstriped muscle fibre, or a mixture of muscle and fibrous tissue—fibro-myomata—are more frequent than the pure fibromata, but they are not by any means common.

Unstriped muscle tissue occurs in the ovary in the form of longitudinal bands, which are prolonged from the ovarian ligament and penetrate the tissues of the par-oöphoron.

In determining the nature of a solid ovarian tumour we encounter the well-known histological difficulty of deciding between a myoma and a spindle-celled sarcoma.

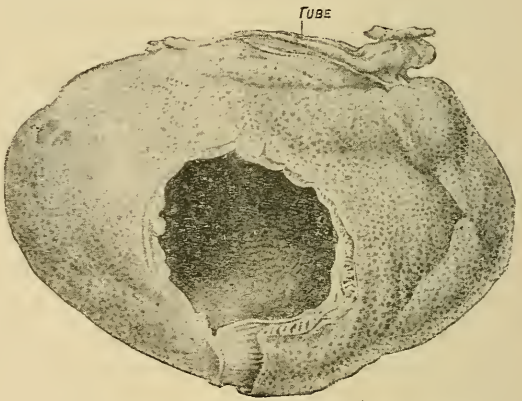

Fig. 20.—Tumour of the Ovary from a Seven-months' Fœtus. A little less than natural size. (After *Doran.*)

Fibro-myomata of the ovary exhibit on section the whorled appearance so characteristic of uterine myomata and fibro-myomata; like these tumours they sometimes calcify and are also liable to myxomatous changes.

They are rarely observed before the age of forty.

The museum of the Royal College of Surgeons contains a specimen weighing over 7 kilogrammes, removed by Sir Spencer Wells from a single woman sixty-eight years of age. She had noticed the tumour eight years. It had a good pedicle; the Fallopian tube and mesometrium were free from disease.

Sarcomata.—The ovary (like the kidney and retina) is very prone to become the seat of sarcoma in early life; to

this succeeds a period of comparative immunity, followed by a second period of renewed but diminished liability.

Ovarian sarcomata (oöphoromata) of infancy attack both ovaries in about half the cases; the tumours grow very rapidly, attain formidable proportions, and quickly destroy life. Their removal is attended with an excessively high rate of mortality, and in those which recover quick recurrence is the rule.

In structure they consist of round or spindle cells, in which collections of cells are often conspicuous, resembling the

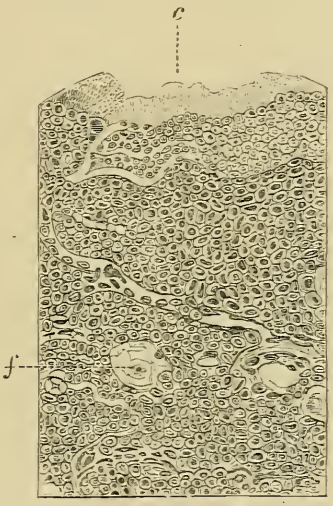

Fig. 21.—Histologic Characters of the Tumour of the Ovary of a Seven-months' Fœtus. (After *Doran*.)
c, Wall of the cavity; *f*, ovarian follicle with ovum.

alveolar disposition of cancer. The supposed cancerous alveoli are ovarian follicles entangled in the sarcomatous tissue, in the same way that epithelial acini become mixed up in sarcomata of secreting glands: muscle fasciculi in sarcoma of muscle; uriniferous tubules and glomeruli in renal sarcoma, etc.

Sarcoma may attack an ovary in an unborn child. Of this rare condition Doran* has described an admirable example. The subject was a fœtus born at the seventh

* Trans. Path. Soc., vol. xl. p. 200.

month, with its abdomen distended and the subcutaneous veins prominent. It survived the birth only two minutes. On opening the abdomen, ascitic fluid escaped, and an ovarian tumour was discovered on each side. The larger tumour is shown a little reduced in size in Fig. 20. "When fresh, it was of a bright pink colour, faintly tinged with lilac." The surface exhibited numerous minute elevations, as though produced by cysts. There were no adhesions. The tumour consisted of a thin shell of solid material, enclosing a large central cavity containing clear fluid. The tumour of the left ovary was slightly smaller than its fellow. Sections of the tumour when viewed with the naked eye appeared as a wide-meshed network with trabeculæ, the spaces being filled with semi-transparent material. Under the microscope the trabeculæ appeared to consist of a multitude of small round cells in a homogeneous matrix. Among this tissue ovarian follicles were recognised (Fig. 21).

The first period of exceptional liability ends at puberty, and a glance at table D on page 178 will furnish some idea of the relation of oöphoromata to infancy and childhood. It is an important clinical fact that these tumours are rarely sources of pain, and often cause no inconvenience until quite in the late stages.

Ovarian sarcomata are rare between the sixteenth and twenty-fifth years. From this age to forty-five they occur occasionally, and are usually limited to one ovary. Like oöphoromata, they grow quickly and destroy life rapidly. Their removal is attended with grave risk, convalescence is tardy; recurrence and death within a year are the rule.

Ovarian sarcomata in adult women are more likely to be regarded as fibro-myomata or fibromata than as oöphoromata, for they are of firmer texture and present occasionally a whorled appearance. The distinction is further hampered by the fact that they mainly consist of spindle and fusiform cells. Pain and ascites are frequent concomitants of ovarian sarcomata occurring in adults.

Primary Carcinoma. — Many tumours of the ovary described as primary carcinomata prove, on careful examination, to be sarcomata. Much confusion has arisen from the fact that ovarian follicles entangled amidst sarcomatous tissue

mimic the structural peculiarities of carcinoma (Fig. 21). Nevertheless, tumours of the ovary are occasionally encountered in which the chief changes are centred in the follicles (Fig. 22). As the membrana granulosa is composed of epithelium, tumours of this character come strictly under the definition of a carcinoma. Such tumours conform in

Fig. 22.—Histologic Characters of Primary Ovarian Carcinoma. The changes in the follicles are well shown. (*Zweifel.*)

their clinical characters to cancer in general—they grow rapidly and infect the peritoneum. When removed, rapid recurrence is the rule, and speedy death. In the majority of cases the peritoneum is infected before the patients come under observation, hence operations are rarely undertaken; and even when an attempt is made to remove one, the procedure is usually abandoned as hopeless when the surgeon enters the cœlom. Primary cancer of the ovary requires careful investigation with a full supply of material.

Shattock* has recorded a *case of columnar-celled carcinoma of the ovary.* The ovary was converted into a great lobulated oval tumour 27·5 cm. by 12·5 cm. in its chief diameters. Histologically, it consisted of tortuous loculated channels of various forms, according to the direction of their section, lined with remarkably tall, slender, and very closely compressed columnar epithelium, disposed in a single layer,

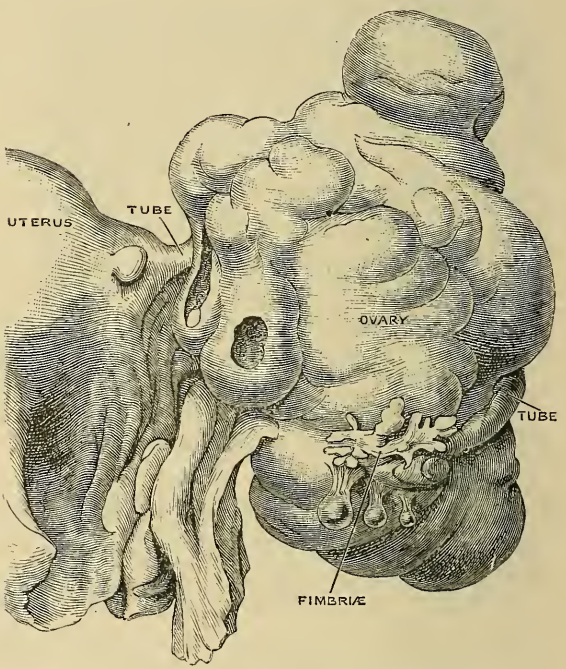

Fig. 23.—Deposits in Ovary secondary to Cancer of Breast. Both ovaries were affected. Nearly natural size.

and everywhere bounding a lumen. "The stroma between the spaces is of a delicate, richly-celled connective tissue, and is about in the same proportion as the tubular elements. The contents of the spaces are sharply demarcated from the cells, and consist in many of an unstained, glassy, minutely fissured substance, presenting very clear traces of concentric lamination."

* Trans. Path. Soc., vol. xl. p. 208.

The tumour had only been noticed six months before the patient came under observation. An attempt was made by Mr. Pitts to remove it, but the patient's condition became so critical that the operation was abandoned.

Secondary Cancer.—It is a curious rule that organs which are frequently the seat of primary cancer are rarely the seat of secondary deposits, and *vice versâ*. To this the ovary is no exception, and it is somewhat remarkable that secondary cancer affects both organs in more than half the cases.

The relative frequency with which the ovary is affected with secondary deposits of cancer has not been investigated on a very extensive basis. It is known that mammary and uterine cancer, as well as melanomata, occur as secondary deposits in this organ.

Dr. Sidney Coupland * compiled some statistics from the Reports of the Middlesex Hospital, 1867 to 1874 inclusive, showing the relative frequency of secondary implication of viscera in mammary cancer, as ascertained from *post-mortem* examination.

The total number of cases was eighty-nine; the ovaries were attacked five times. In three cases both ovaries were the seat of secondary deposits; and in two, one ovary only was affected.

Secondary deposits of cancer in the ovary are more frequent than even Dr. Coupland's interesting paper indicates. During the years 1887, 1888, and 1889 there were fifty-two inspections of patients dying from cancer of the uterus, and twenty-nine from cancer of the breast. The frequency with which secondary deposits were found in the ovaries is shown in the subjoined table:—

UTERUS.	OVARIES.
52 cases.	Deposits in both glands, 3 cases.
	Deposits in one gland, 3 cases.
BREAST.	
29 cases.	Deposits in both glands, 3 cases.

I intentionally selected those three years because during that period especial attention was devoted (by Mr. L. Hudson,

* Trans. Path. Soc., vol. xxvii. p. 259.

who made the examinations) to the diseases of the internal generative organs of the female. Care was taken to exclude examples in which the ovaries were involved by *extension* of uterine cancer.

Secondary deposits of carcinoma in one or both ovaries are very frequent when the pylorus is the seat of the primary disease.

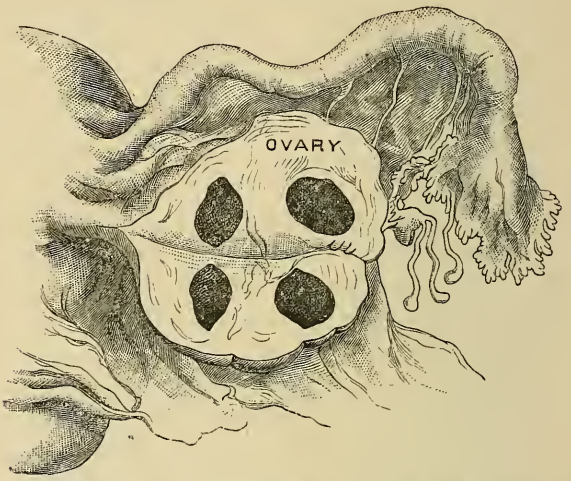

Fig. 24.—Section of an Ovary, with Secondary Deposits of Melanoma. Natural size.

Many cases of secondary nodules of melanotic tumours have been observed in the ovary. This is due to two causes: secondary nodules in this disease are widely disseminated, and the colour betrays them to the eye of even the least experienced pathological anatomist.

Secondary deposits of carcinoma in the ovary have no practical interest.

CHAPTER VII.

SIMPLE CYSTS AND ADENOMATA.

It was pointed out in chapter i. that the ovary consists of an egg-bearing portion, the **oöphoron**, and a region, the **paroöphoron**, in which ova are not found. The relation of these two regions to each other and to the parovarium are represented in this diagram (Fig. 25). Each of these—the

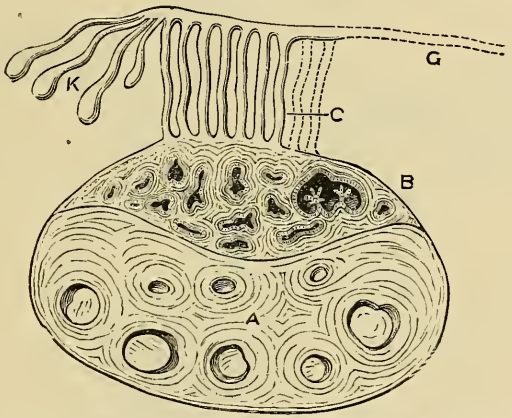

Fig. 25.—Diagram representing the Cyst Regions of the Ovary.
A, Oöphoron; B, paroöphoron; C, parovarium; K, Kobelt's tubes; G, Gartner's duct.

oöphoron, paroöphoron and parovarium—gives rise to tumours and cysts with peculiar and distinctive characters.

The Oöphoron.—This part of the ovary is the source of three varieties of tumours :—

1. Simple Cysts,
2. Adenomata,
3. Dermoids,

all of which arise from the ovarian follicles.

SIMPLE CYSTS.

These may be unilocular or multilocular. An incipient oöphoronic cyst is shown in Fig. 26 ; it is an enlarged ovarian follicle, and its walls are furnished with a well-marked

membrana granulosa. In a very early stage it is easy to demonstrate the relation of such a cyst to the oöphoron. As the cyst enlarges it causes rapid absorption of the paroöphoron, and the region in which it arose is then not so easily demonstrable.

It is only by patiently waiting for opportunities of securing cysts in very early stages that it is possible to elucidate their mode of origin. Much of the confusion which obscures the pathology of this question is due to the fact that most investigators have devoted their attention mainly to large cysts.

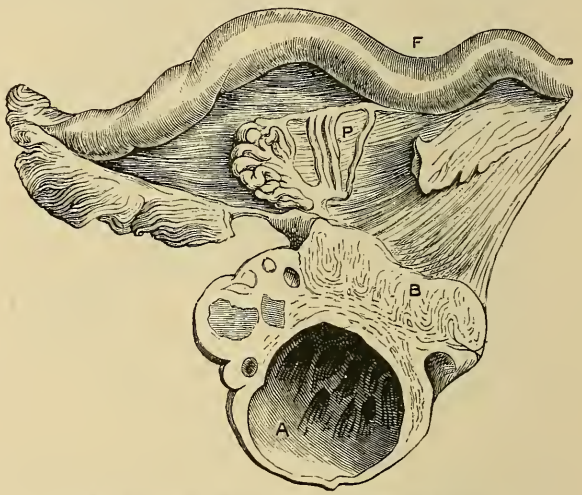

Fig. 26.—Cyst of the Oöphoron. Natural size.
A, Incipient cyst; B, paroöphoron; P, parovarium; F, Fallopian tube.

In cysts containing three or four litres of fluid the walls will be found to consist entirely of fibrous tissue; no epithelium can be detected. It is impossible to state definitely the size of a cyst in which the epithelium disappears. The absence of epithelium is due to atrophic changes, the consequence of the continual pressure exerted by the accumulating fluid. Precisely similar changes may be studied in the mucous membrane of greatly distended gall-bladders. In large multilocular cysts, although the big loculi may be destitute of epithelium, the smaller cavities will retain their epithelium, which may be columnar, cubical, or stratified.

An extremely simple means of determining an oöphoronic tumour is to note the relation of the Fallopian tube; it lies curled up on the cyst, and when the parts are stretched the tube and tumour are separated by the mesosalpinx. This

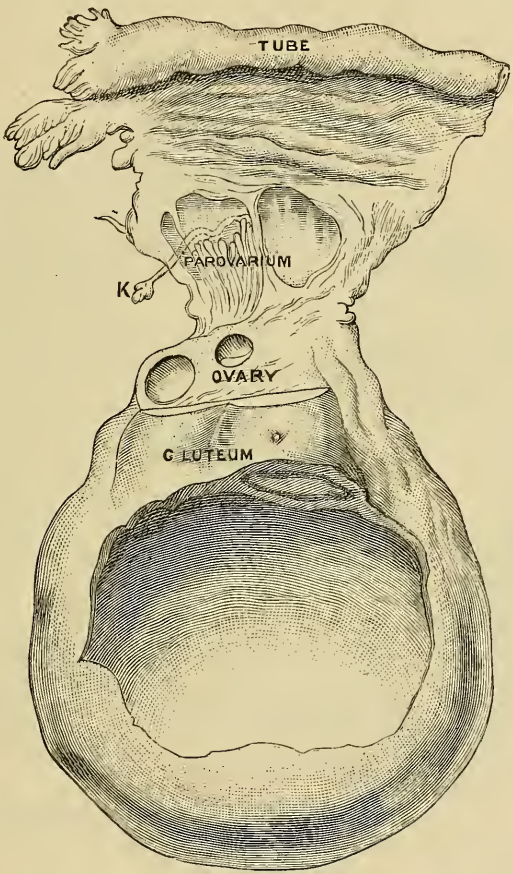

Fig. 27.—Small Cyst of the Oöphoron. Natural size.
K, A fimbriated Kobelt's tube.

relationship comes out definitely by comparing Fig. 27 with Fig. 60.

ADENOMATA.

An ovarian adenoma is not only an important but an extremely interesting variety of tumour. As a rule, it has a dense fibrous capsule, and the surface is frequently lobulated.

Such a tumour attains great dimensions, and is composed of innumerable cysts, which vary in size from a cavity no bigger than a pea to one holding a litre or more of fluid. Critical dissections of such cysts enable us to recognise three varieties of loculi. In typical specimens a honeycomb-like mass will be found projecting into some of the larger cavities and

Fig. 28.—Portion of a large Ovarian Adenoma, showing the Varieties of Loculi. *c*, Primary ; *d*, secondary loculi.

occupying usually one-third of its circumference, so that a section of the cavity resembles a signet-ring—such are called primary—whilst the cavities occupying the honeycomb portion are secondary cysts, and are, as a matter of fact, mucous retention cysts. The third set of loculi contain no honeycomb-like structures, are of small size, and histologically are indistinguishable from distended ovarian follicles. The

relations of the primary and secondary cysts to each other are shown in Fig. 28.

When ovarian adenomata of this character are quite fresh, if the smaller loculi are punctured with a knife and the fluid watched as it flows through the opening, a small opaque body, about the size of a rape-seed, will often be detected escaping. These bodies have been described as ova.

Fig. 29.—Section of the Wall of a Loculus from an Ovarian Adenoma, showing the glandular disposition of the Epithelium.

The primary cysts in their early stages are lined with rich columnar epithelium and often contain mucous glands (Fig. 29). The fluid contained in the loculi of ovarian adenomata is identical in its physical and chemical characters with mucus. Occasionally it is as thick and tenacious as jelly. The tissue lining the cavities is in many specimens indistinguishable from mucous membrane.

The epithelium lining the loculi of ovarian adenomata sometimes attains extraordinary proportions. The largest columnar cells I have ever seen occurred in these tumours

(Fig. 30), excelling those remarkable cells found in the glandular spaces of rectal polypi occasionally found in children. The translucency of the cells is due to the mucus they contain. The source of these large cells is undoubtedly the epithelium lining the ovarian follicle, and it will be instructive for those who are not familiar with the beautiful columnar epithelium displayed in carefully prepared sections

Fig. 30.—Loculi of an Ovarian Adenoma lined with unusually large Mucus-laden Epithelium.

of ovarian follicles to refer to Fig. 2, page 3. It is of great importance to appreciate the high development of the follicular epithelium, as its metamorphosis has a very important bearing on the nature of ovarian dermoids.

In some specimens of ovarian adenomata, the secondary loculi give rise to projections on the periphery of the tumour; when numerous and close together these projections cause the tumour to resemble a colossal bunch of grapes.

Lawson Tait* describes corymbose adenomata of this kind as Rokitansky's tumour.

It has been mentioned that in the human ovary, when cystic, the relation between the oöphoron and paroöphoron is quickly destroyed. In some mammals, especially the mare, the paroöphoron is relatively very large. It happens that when the ovary of the mare is cystic, the paroöphoron is not invaded by the cysts, even when the organ is much enlarged. Thus, in the specimen from which Fig. 31 was

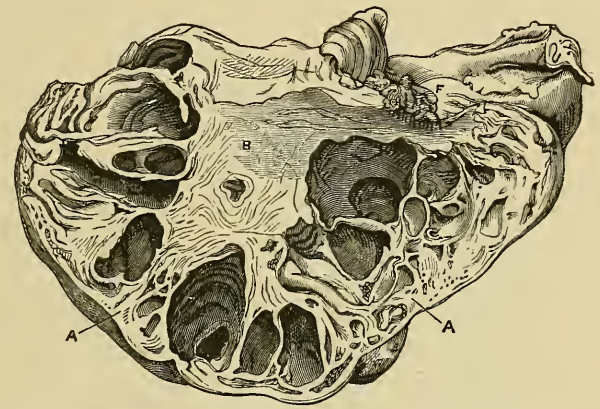

Fig. 31.—Transverse Section of an Ovarian Adenoma from a Mare; it weighed forty-two kilogrammes.

A, Oöphoron; B, paroöphoron; F, Fallopian tube.

obtained, the tumour weighed 42 kilogrammes; yet on transverse section it was readily observed that the paroöphoron remained quite distinct from the egg-bearing portion. The loculi in this big tumour were, in many instances, indistinguishable from enlarged ovarian follicles: some of the cavities contained mucous membrane.

Malignancy of Ovarian Adenomata. — Some surgeons hold the opinion that a rapidly growing ovarian adenoma may, if its loculi burst during operation, infect the peritoneum, and secondary knots appear in the abdominal wall; also recurrence may take place in the pedicle.

Many cases have been recorded in which the cicatrix in the belly-wall, after the removal of an ovarian adenoma, "has

* "Diseases of the Ovaries," 1883, p. 174.

become the seat of cancer." Unfortunately, those who recorded such cases have in nearly all instances failed to fortify their statements by descriptions of the histology of the so-called cancer.

In cases in which recurrence, after removal of an ovarian adenoma, has been supposed to occur, the suspicion was not confirmed by a *post-mortem* examination. In one case which came under my observation, a woman was admitted into the cancer ward of the Middlesex Hospital for supposed recurrence after removal of an ovarian adenoma, in St. Bartholomew's Hospital, a year previously. Sceptical in this question of malignancy, I followed the case to its end. At the *post-mortem* inspection the supposed recurrence was an adenoma of the remaining ovary.

The cases of recurrence in the scar are of interest and capable of explanation without impeaching the innocence of ovarian adenomata. It is well known that epithelium accidentally implanted into vascular tissues will occasionally act as a graft and give rise to a cyst or tumour. Such "implantation cysts" may be studied in the fingers, in the eye, and in any scar involving skin. In this chapter it has been pointed out that ovarian adenomata are rich in epithelium. It is, therefore, extremely probable that fragments of detached epithelium adhere to the margins of the abdominal incision and are included when it is closed, retain their vitality, and give rise to a small tumour.

The capability of accidentally detached clusters of epithelium to form independent tumours is demonstrated in the case of dermoids (page 75) and papillomatous cysts (page 88).

Every case in which the innocency of an ovarian adenoma is doubtful should be reported in detail, and the microscopical characters of the primary and secondary tumours described and, if possible, illustrated by sketches.

CHAPTER VIII.

OVARIAN DERMOIDS.

A VERY large proportion of oöphoronic cysts contain skin or mucous membrane, or both these structures, and some of the many organs peculiar to them, such as hair, sebaceous, mucous, and sweat glands, dermal bone, horn, nail, nipples

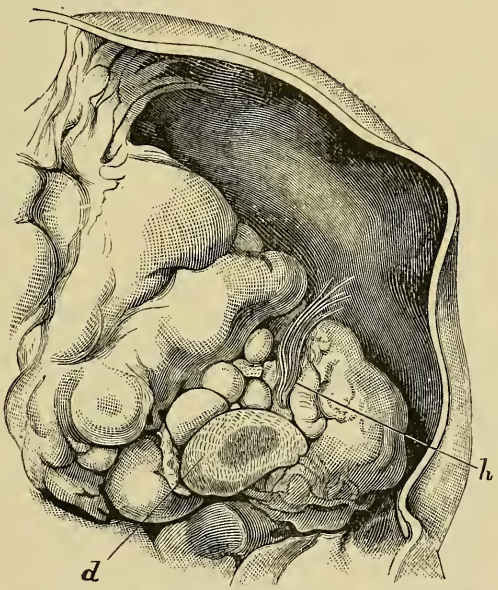

Fig. 32.—Ovarian Adenoma, presenting a Cutaneous Clump (*d*) with a Tuft of Hair (*h*). (Museum, St. Thomas's Hospital.)

and mammæ; teeth also occur in great numbers: such are called **dermoids**. A detailed description of the various structures will be given in the following chapter.

Dermoids may be multilocular or unilocular. They may attain a weight of 20 or even 40 kilogrammes. Sometimes a cyst will be lined throughout with typical mucous membrane covered with regular columnar epithelium and beset with mucous glands.

Poupinel first detected mucous membrane in ovarian tumours, but my observations were made in ignorance of his writings.

It is necessary to indicate how impossible it is to separate the three varieties—cysts, adenomata, and dermoids—from each other. Occasionally a tumour will come to hand displaying an internal lining of stratified epithelium which would serve for skin or mucous membrane; yet if it possess a few hairs it is called skin and the cyst becomes a dermoid.

The contents of a dermoid usually consist of a pultaceous mixture of shed epithelium, fat, and loose hair. In many complex multilocular dermoids some of the loculi contain mucous membrane and are filled with mucus; others possess hairs; and a few may be quite barren. There is in the museum of St. Thomas's Hospital a specimen, placed in the collection as a typical example of an ovarian adenoma (multilocular ovarian glandular cyst): sprouting from a cutaneous patch in one of the larger loculi is a tiny tuft of lanugo-like hair (Fig. 32).

It is impossible to determine in many cases, from a mere naked-eye examination, whether an oöphoronic tumour should be regarded as an adenoma or a dermoid. In practice the presence of a tuft of hair or a tooth is a useful and ready way of settling the question. Failing this, a careful microscopical examination is necessary. For instance, the tumour represented (nearly natural size) in Fig. 33 consists of two parts: one a thin-walled cyst (filled with sebaceous material when fresh) lined with piliferous skin. The lower and larger portion resembled, on superficial examination, an adenoma, and was nearly solid. A small tuft of lanugo-like hair, at the spot marked H in the drawing, induced me to make a careful histologic examination of the adjacent tissue. The sections revealed an extraordinary diversity of tissues and organs, such as sebaceous and sweat glands, hair-germs, skin, teeth-germs with typical enamel-organs and dentine papillæ, epithelial pearls, and shapeless masses of epithelium (Fig. 34).

Cysts occur in the oöphoron at all periods of life; and a long list of examples in which these tumours have been of such a size in young girls as to necessitate operative interference is given in tables B and C, pages 176 and 177. In one instance

reported by Keen an ovarian tumour from a girl of fifteen years weighed 44 kilos: the girl weighed 27 kilos.

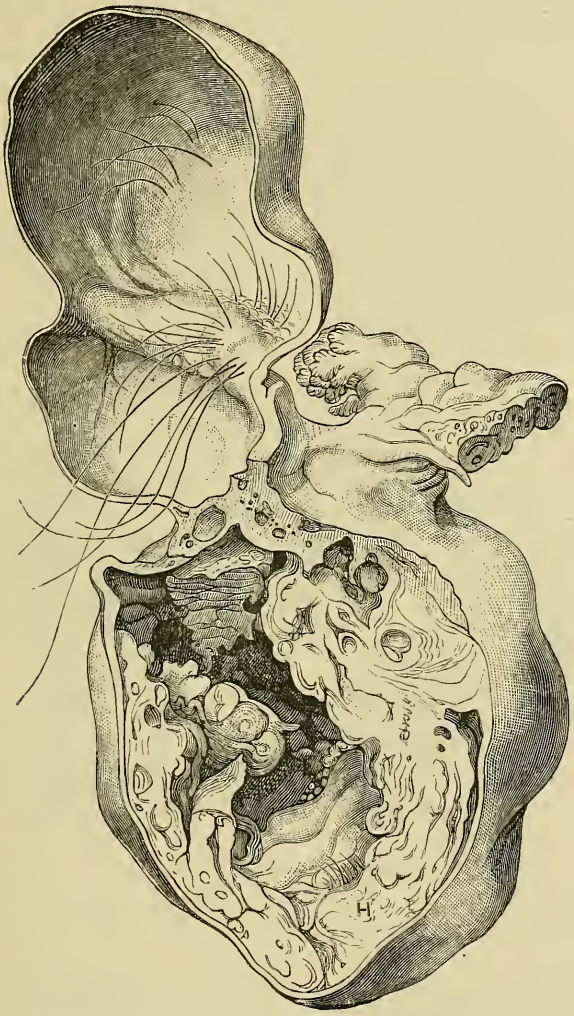

Fig. 33.—Ovarian Dermoid.
The lower part of the tumour contained teeth-germs in early stages of development.
H, Tuft of hair.

Small cysts in the oöphoron are very common at birth (Fig. 35), and are often bilateral; but, so far as I am aware,

after a careful and prolonged investigation of the matter, no authentic example of an ovarian dermoid has been observed in a child before the end of the first year of life. Towards the approach of puberty they have been many times observed. (*See* table C, page 177.)

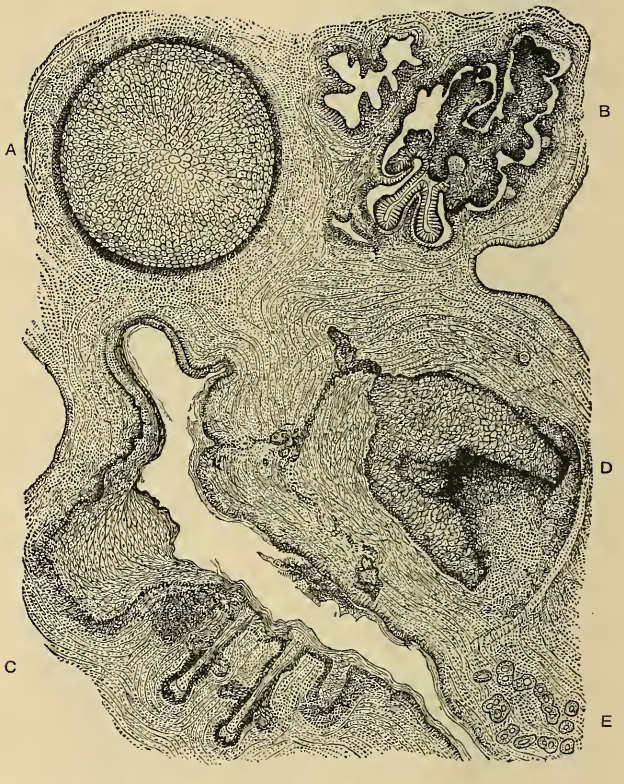

Fig. 34.—Composite Drawing of the Microscopic Appearance of the Dermoid sketched in Fig. 33.

A, An epithelial pearl in section ; B, glandular tissue ; C, developing hairs ; D, a developing tooth ; E, sweat-glands in section.

Ovarian adenomata and dermoids are very common through the sexual period of life, but the liability declines with advancing years; Potter* has recorded an example in a woman eighty-three years of age, who died from a burn.

Adenomata and dermoids are very apt to affect both

* Trans. Obstet. Soc. Lond., vol. xii. p. 246.

ovaries simultaneously; very rarely two independent dermoids may arise in one ovary; and it is a fact that both ovaries may be so distorted and destroyed by dermoids that the true ovarian tissue is unrecognisable to the naked eye; yet these organs are not only able to dominate menstruation, but to discharge their egg-bearing functions successfully.

In 1890 Bantock* performed double ovariotomy on a woman in the third month of pregnancy. Both tumours were dermoids (Figs. 36 and 37). I submitted them to very careful microscopical investigation, but was unable to detect

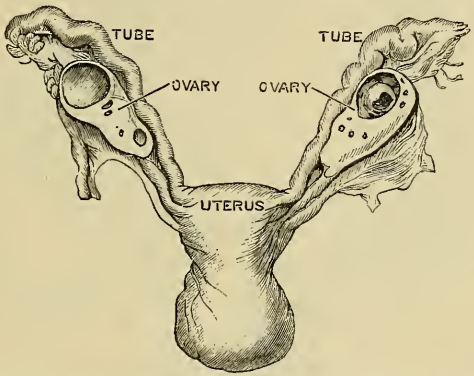

Fig. 35.—Uterus and Cystic Ovaries of an Infant Two Months old. Natural size.

normal ovarian tissues. Knowsley Thornton† and Frederick Page‡ have made similar observations.

Cullingworth§ has described an instance in which both ovaries were converted into dermoids in a woman thirty-nine years of age. She had had twelve children and three miscarriages—the last three months before operation; and he remarks:—"One would find it difficult to define the precise amount of ovarian disease that is necessary to render a woman sterile."

In some similar cases (*see* table F, page 188) a dermoid has been found in one ovary and a typical adenoma in the other.

* *Journal Brit. Gyn. Soc.*, vol. vi. p. 4.

† Trans. Obstet. Soc. Lond., vol. xxviii. p. 41.

‡ *Lancet*, 1893, vol. ii. p. 250.

§ St. Thomas's Hospital Reports, vol. xvii., 1889.

The supposed Malignancy of Dermoids.—In the first edition of this work attention was drawn to the fact that there was reason to believe that ovarian dermoids occasionally exhibited signs of malignancy. It was, however, distinctly pointed out that many cases of ovarian dermoids have been

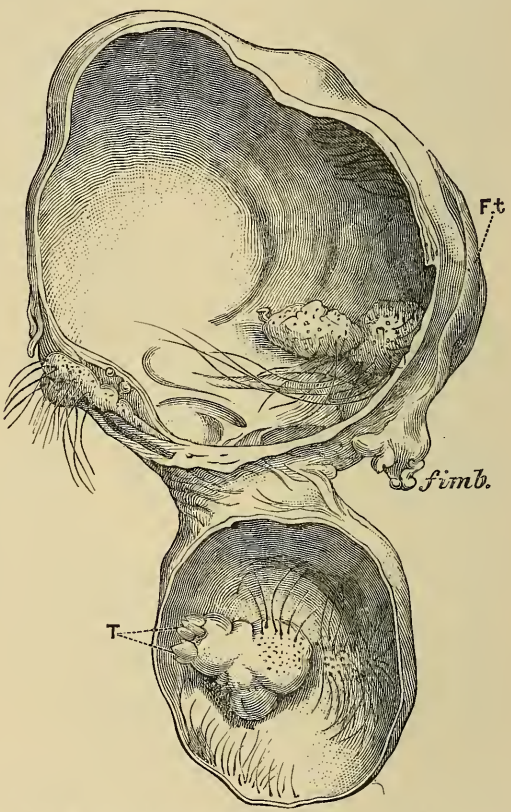

Fig. 36.—Ovarian Dermoid from a pregnant Woman. (The tumour of the left side is represented in Fig. 37.)
Ft, Fallopian tube; *fimb.*, fimbriæ; T, teeth.

described in which the reporters believed sarcomatous tissue to have been present; but such statements must be received with caution, because the heterogeneous character of these tumours introduces a great element of doubt. My subsequent investigation has, however, failed to detect a single instance which can be used to prove recurrence after removal of a

dermoid. Cases have crept into literature in which surgeons believed recurrence had taken place, but it has never been demonstrated by actual inspection of the parts in the course of an operation or a *post-mortem* examination.

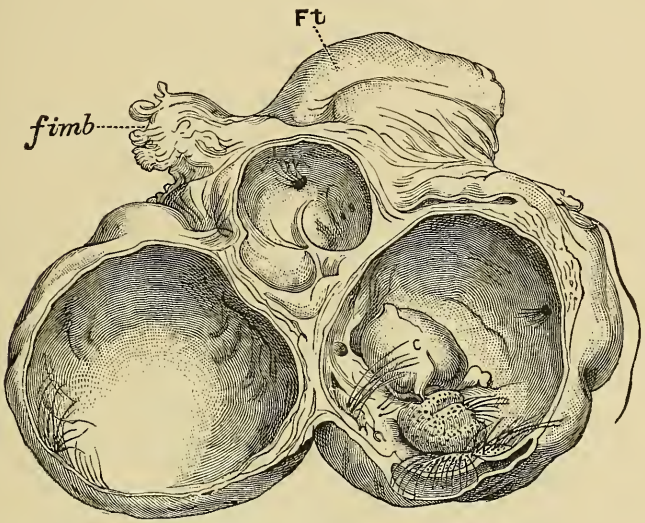

Fig. 37.—Ovarian Dermoid.

The loculus, c, contains a small cyst filled with tissue microscopically identical with brain matter. Ft, Fallopian tube; *fimb.*, fimbriæ.

Several examples have been recorded in which secondary dermoids have been observed among the abdominal viscera, but this phenomenon is capable of satisfactory explanation. (*See* chapter x.) It is also important to emphasise the fact that in women **dermoids have never been found growing primarily from any abdominal viscus save the ovary.**

CHAPTER IX.

OVARIAN DERMOIDS (*continued*).

THE cutaneous organs found in ovarian dermoids present such extraordinary variation as to demand separate consideration.

Skin.—This, in some specimens, is very thick, but it rarely possesses papillæ, and these when present are not furnished with touch corpuscles. Pigment is occasionally observed in the deep layer which would correspond to the rete mucosum. An epidermis may be demonstrated; sometimes it is very thick and the superficial layers are shed into the cavity of the dermoid in broad flakes. The usual arrangement of the epithelium resembles that which is found on the buccal mucous membrane rather than on skin in general. The subcutaneous tissue of dermoids is often particularly rich in delicate fat.

In a few instances the epidermis has been found transformed into **nail.** In at least two instances an ill-formed nail has been detected at the extremity of a piece of bone resembling a phalanx.

Hair.—This varies in length, colour and amount. A single tuft coiled into a ball and mixed with sebaceous matter is not infrequent, and may attain a length of 50 cm. Mundé* has described and figured a specimen in which a tuft of hair in an ovarian dermoid was 1·50 metre long. Frequently only a few hairs are found scattered on the cyst wall, or the hair may be rolled into balls and lie free in the cyst. Occasionally the shed hair will "felt." The colour is equally capricious, and, as a rule, differs from that on the exterior of the individual. The hair in such cysts changes in colour with age, and in elderly persons becomes quite white and is eventually shed, so that these cysts become actually bald (Fig. 10). In an ovarian dermoid from a mare† the hair

* *American Journal of Obstet.*, vol. xxiv. p. 854.

† Trans. Obstet. Soc. Lond., vol. xxxi. pp. 234 and 253.

resembled that on the animal's mane or tail. In a similar tumour from a ewe wool existed.

Sebaceous Glands.—The extraordinary abundance and large size of these glands is a conspicuous feature of typical ovarian dermoids. They are occasionally transformed into "wens," and, exceptionally, **horns** sprout from them. In

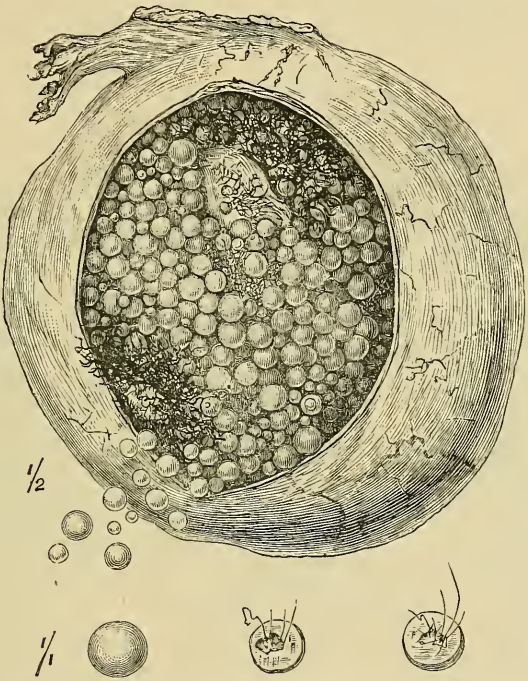

Fig. 38.—Ovarian Dermoid containing 3,930 Epithelial Balls.
(Dr. W. Walter's case.)

one instance I observed a cluster of very large sebaceous glands forming a pedunculated body which, in its minute characters, resembled a "sebaceous adenoma," or those hideous noses which used to be miscalled "lipoma nasi." (*See* Fig. 10, page 19.)

Sweat Glands.—These are not nearly so common as the sebaceous variety, and usually occur in irregular isolated clusters. I have as yet failed to detect the characteristic twist of the duct so constant in normal sweat glands.

Pultaceous Material.—The cavities of ovarian dermoids are often filled with a semi-fluid mixture of epithelium, sebum, fat, shed hairs, and often cholesterine. In small cysts the sebum is sometimes so pure as to be quite white in colour.

The fat may be liquid at the temperature of the body, but solidifies after its removal. In some dermoids it occurs in lumps of the density and colour of cacao-butter. This variation probably depends on the proportion of stearine in the fat.

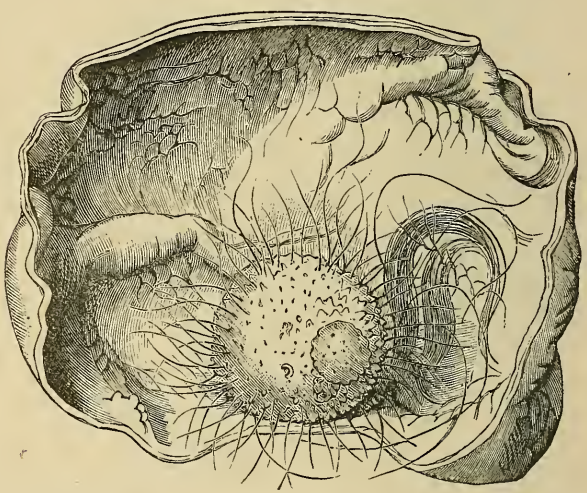

Fig. 39.—Ovarian Dermoid, with a Pseudo-mamma. (Museum, Royal College of Surgeons.)

Epithelial Balls.—In some rare cases the shed epidermis forms rounded pill-like bodies which I ventured to call epithelial balls. As a rule, three, four, or even twenty, and perhaps fifty, may be present. In one remarkable specimen which I examined for Dr. William Walter, the number amounted to 3,930. Each contained, as shown in Fig. 38, one or more hairs as a nucleus, around which the epithelial masses cohered to form balls.

Ovarian Mammæ.—It is not uncommon to find in the interior of an ovarian dermoid one or more tags of skin resembling a **nipple** associated with teeth and hair. Not infrequently, these nipple-like processes of skin are attached to more or less rounded projections of tissue, which recall in

a striking manner the shrunken mammæ of a woman who has given suck to many children. The nipple-like processes of skin are imperforate and beset with large sebaceous glands. In other cases the mammæ may be plump and well formed,

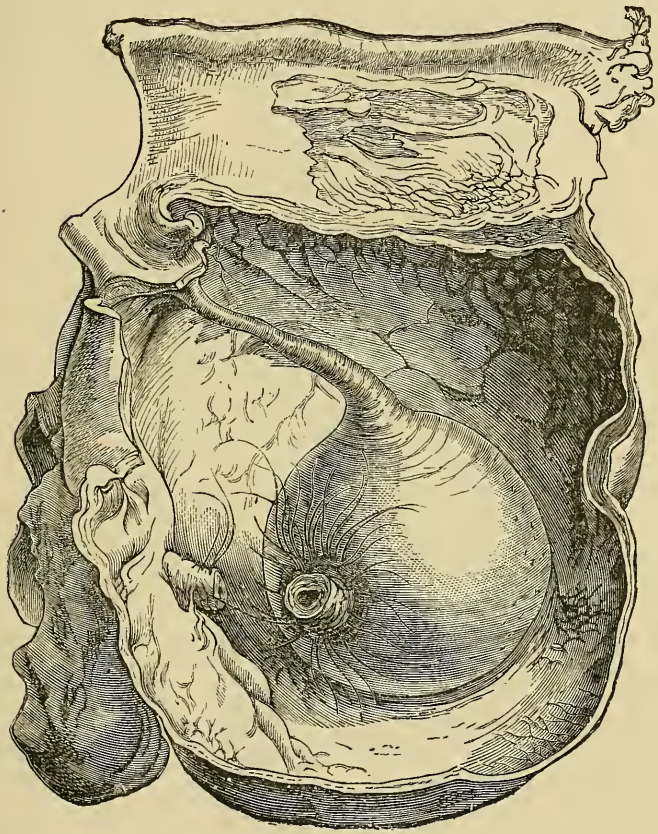

Fig. 40.—Mammiferous Dermoid. Half the natural size.
The gland has two tube-like nipples, one of which has been divided.

but consist of fat covered with skin. Even in such a case no ducts or gland-tissue occupy the substance of the mass. The nipple may be surrounded by an areola. Such are called **pseudo-mammæ** (Fig. 39).

Complete forms are sometimes found with glandular acini, ducts, and a perforated nipple. The specimen in Fig. 40 was

an example of this, and furnished a viscid fluid which exhibited the microscopical characters of milk, and contained colostrum globules. The glandular tissue was embedded in rich yellow fat.

Shattock* described a mammiferous dermoid in which the mamma possessed an imperforate nipple, but a cyst filled with colostrum occupied its base. On one occasion, whilst operating on a suppurating irremovable ovarian dermoid, my

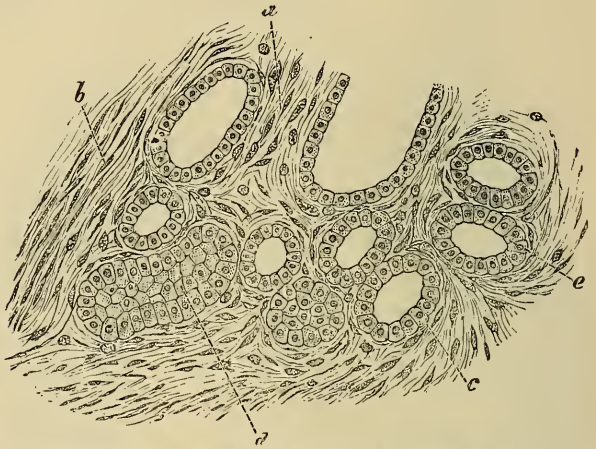

Fig. 41.—Histologic Characters of the Ovarian Mamma described by Velits.
a, Pigmented connective tissue; *b*, plain muscle fibre; *c*, *d*, and *e*, gland-acini and ducts.

finger recognised, whilst exploring the interior of the tumour, a mamma; I drew it to the surface and excised it.

The most complete ovarian mamma from a histological point of view is one described by Velits.† This specimen is also interesting, as the nipple was surrounded by a rosy areola with clusters of Montgomery's tubercles and small tufts of blonde hair. Its histological structure was characteristic of a true mamma (Fig. 41).

The museum of the Middlesex Hospital contains a good specimen of an ovarian mamma furnished with a perforated nipple. A few teeth are situated near the base of the mamma (Fig. 42).

The presence of nipple-like processes had been previously

* Trans. Path. Soc., vol. xxxix. p. 442.

† Virchow's *Archiv*, Bd. cvii. s. 505.

noticed in ovarian dermoids; a rudimentary mamma was observed by Haffter;* and De Sinéty† has recorded a similar observation.

In connection with these organs it may be interesting to

Fig. 42.—Ovarian Mamma. Natural size. (Museum, Middlesex Hospital.)
The lower figure shows the mamma in section.

mention that Mr. A. H. F. Cameron,‡ in a paper on supernumerary mammæ, ascribed to Laycock the suggestion that a mamma might make its appearance on any part of the body,

* *Arch. der Heilkunde*, xvi. 56, 1875.

† "Traité Prat. de Gyn.," 2nd ed. 1884, p. 749.

‡ *Journal of Anat. and Phys.*, vol. xiii. p. 152.

and there seemed to be a power of producing this particular organ reminding one of the development of hair and teeth in ovarian cysts.

Thyroid Gland.—In 1893 I removed a large dermoid from a woman fifty years of age, and on examining it detected a firm, rounded, encapsuled body as big as a walnut. Its cut surface so resembled a thyroid gland that I examined it

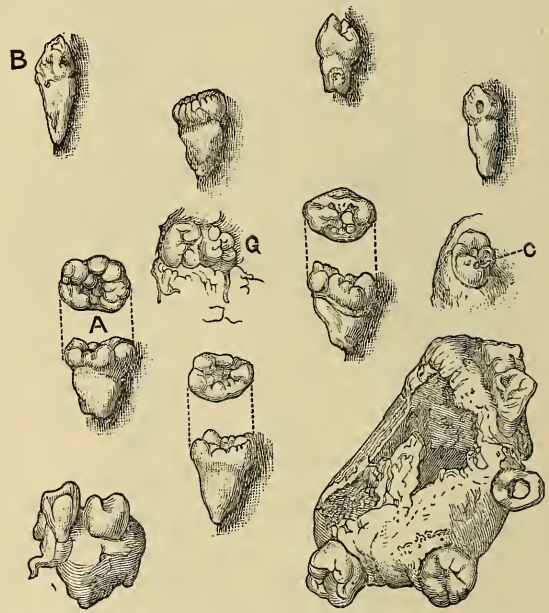

Fig. 43.—Ovarian Teeth: showing Canines, Bicuspidate and Multicuspidate Teeth. G, Geminated tooth; B, caniniform tooth; C, crown showing so-called caries; A, multicuspidate crown.

microscopically. The body was composed of closed vesicles filled with colloid material and lined with the sub-columnar epithelium so characteristic of the normal thyroid gland.

Teeth.—A large proportion of ovarian dermoids contain teeth. In number they vary considerably; sometimes two or three are found, in others twenty, and as many as 400 have been counted. It is unusual to find more than twelve teeth in a cyst. They may be embedded in loose ill-formed bone, or project from a flat bony plate like nails driven through a piece of thin wood.

Teeth are not scattered irregularly through the tumour unless present in very great number, but are collected together in one or more groups. They vary greatly in shape, and resemble incisors, canines, and supernumerary teeth (Fig. 43).

In the majority of cases the root is single; when the crown

Fig. 44.—Microscopic Characters of a Multicuspidate and Bicuspidate Ovarian Tooth.

In A the pulp chamber contains osteo-dentine; in B the pulp chamber is exceedingly small, and occupied with osteo-dentine; cementum is absent from the roots

is simple the root is long; multicuspidate teeth have short roots. Ovarian teeth with more than one root are rare.

Sometimes the roots are embedded in soft tissue; often the teeth remain hidden in crypts or complete cysts. When the crown projects boldly it may be surrounded with pink tissue resembling gum.

Ovarian teeth are composed of enamel and dentine; cementum is by no means constant. The enamel is lodged on the crown in lumps or hummocks with deep ravines extending to the dentine. The enamel prisms run in all directions.

Fig. 45.—Germ of an Ovarian Tooth.
E, Enamel organ; P, papilla.

The pulp is very irregular; some of the teeth, especially those resembling incisors and canines, may lack a central chamber. In multicuspidate teeth the pulp chamber is of fair size. In some the pulp is converted into osteo-dentine (Fig. 44); in others it is full of fat globules.

The presence of nerves in the pulps of ovarian teeth was asserted by Salter, and tissue resembling nerve-fibrils may be detected in pulp suitably prepared.

Ovarian teeth develop on the same principle as normal teeth. I have succeeded in detecting the various stages. The enamel organ, gubernaculum, dentine papilla, etc., are represented in Figs. 34 and 45. The hummocky condition of the enamel may be due to the irregular or distorted shape of the enamel organ.

For several years I made a series of observations in order to determine if the development and eruption of ovarian teeth were in any way influenced by age, and to ascertain if,

like the hair of dermoids, they were shed in advanced life. Nothing definite resulted from the inquiry. For instance, Mr. John Ewens, of Clifton, sent me an ovarian dermoid as large as a cricket-ball he successfully removed from a girl of seven years. Besides many teeth, six of which were fully erupted, it contained a lock of hair 75 cm. in length. Yet in a dermoid removed from a woman in middle life germs of teeth in great abundance were found, but none of them had reached the stage of calcification.

Epithelial Pearls.—The common form of epithelial pearl consists of concentric laminæ of horny epithelium. The central portions in some specimens are structureless and transparent, like horn; in others the cells are large and distinct (Fig. 34). Sometimes the epithelium forms onion-like layers without any tendency to cornification.

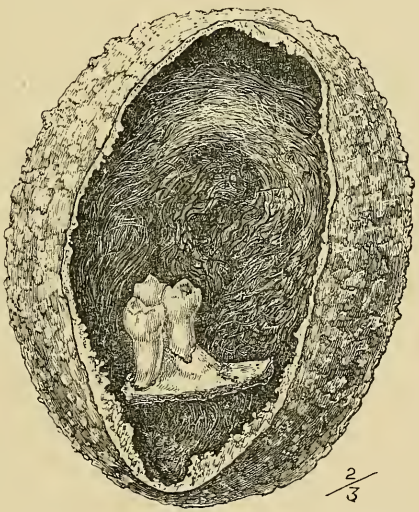

Fig. 46.—Ovarian Dermoid containing Hair and Teeth. (Museum, Middlesex Hospital.)
The fibrous capsule has calcified.

The common mode by which pearls are formed is by the retention and subsequent moulding of shed epithelium in the recesses of sebaceous glands, in mucous crypts, or in the folds of epithelial surfaces. Some are probably formed on the principle of enamel organs.

Bone.—This tissue is often present in ovarian dermoids in shapeless masses resembling the alveoli of jaws, or as irregular plates of extremely dense bone, "similar to the facial bones of an osseous fish" (Doran). Those writers who believed that dermoids were due to parthenogenesis saw in these ill-formed pieces of bone, jaws, skulls, pelves, limbs, etc., and other skeletal elements, as their fancies led them. Rarely the fibrous capsule of a dermoid becomes calcified in flakes until a hard shell is formed (Fig. 46).

Nerve-tissue.—Our knowledge in relation to nerve-tissue in ovarian dermoids is not very satisfactory. Several observers have detected the presence of tissue which in its histological characters was indistinguishable from "cerebral matter."* In several cases the brain substance was enclosed in a firm capsule in structure like dura mater lined with a delicate pia mater.† A similar example has come under my own notice. A brain-containing cyst is shown in Fig. 37.

Peripheral nerves have been described. It has already been mentioned that Salter asserted the existence of nerve-fibrils in the pulps of ovarian teeth.

The whole question of nerve-tissue in dermoids requires careful study, aided by the improved methods of staining now employed in neurological histology.

* Gray: Med.-Chir. Trans., vol. xxxvi. p. 434.

† Neumann: Virchow's *Archiv*, Bd. civ. p. 462.

CHAPTER X.

OVARIAN DERMOIDS (*concluded*).

THERE is an important phenomenon occasionally observed in regard to certain forms of abdominal tumours termed **epithelial infection,** which reaches its highest manifestation in connection with ovarian dermoids. It is a matter of great interest, because it completely disposes of the view that dermoids may exhibit malignant characters and give rise to secondary deposits.

In 1866 Moore* described the following remarkable case:—A married woman, twenty-eight years of age, had suffered from an abdominal tumour for ten years. It suppurated, and the pus escaped through a fistulous opening at the umbilicus. She died a few days after her admission into the Middlesex Hospital. At the *post-mortem* examination a huge ovarian dermoid, universally adherent, was found, containing large quantities of hair and a great number of teeth.

"Among the peritoneal adhesions were many small cysts, some of which were attached by slender pedicles to the main cyst; whilst others were entirely unconnected with it, but, like it, contained soft, cheesy, yellow epithelium mixed with hairs. One was in the great omentum. Two, which were in, or near, the right broad ligament, and of the sizes of a nutmeg and a walnut, had ossified or chalky walls. Many small ones were in situations where they might have been supposed to be diseased absorbent glands, as in the pelvis or mesentery. . . . The largest of the loose cysts lay among the adhesions of the small intestines. It was completely separated by the bowels from the principal cyst, and it was rather larger and longer than a hen's egg."

Kolaczek† reported a case in which Martini removed from a single woman, forty years of age, an ordinary ovarian dermoid as large as a man's head. Its surface was perfectly smooth.

* Trans. Path. Soc. Lond., vol. xviii. p. 190.

† Virchow's *Archiv*, Bd. lxxv. p. 399.

After the escape of some free fluid the peritoneum was seen to be dotted with small yellow knots; many of them were furnished with a small tuft of light hair 1 cm. in length, which projected into the peritoneal cavity (cœlom).

In 1883 Fraenkel* published a case which throws quite a new light on these conditions:—

A woman, thirty-five years of age, with a tumour in her belly fell from a vehicle; the tumble caused enlargement of the tumour and peritonitis. Nine months later she submitted to operation. The belly contained dirty fluid mixed with hairs, which had escaped from a ruptured dermoid in the left ovary. The peritoneum was beset with small dermoids hanging by long thin pedicles. Somewhat larger ones were found in the neighbourhood of the liver, diaphragm, and mesocolon; isolated hairs were found implanted on the omentum and sprouting into the cœlom.

Grawitz† has recorded a similar observation. A woman, forty years of age, had a dermoid in each ovary; the abdominal viscera were universally adherent, and secondary dermoids existed among the adhesions; some were so small as to be barely visible to the eye, others were of the size of eggs. Similar dermoids were detected between the liver and the diaphragm.

An impartial consideration of these cases, supported by the evidence of accidental implantation of conjunctival epithelium and eyelashes into the anterior chamber of the eye, which have been actually observed to grow and form cysts,‡ indicates clearly enough that peritoneal infection in the cases detailed above results from the diffusion of the epithelial elements of ovarian dermoids over the peritoneum in consequence of rupture.

In Jessop's§ oft-quoted case, which is supposed to illustrate the occasional malignant tendency of ovarian dermoids, the recorded facts are as follow:—

The patient was a girl of thirteen years. The tumour, which was removed during life, consisted of one large cyst

* *Wien. med. Wochenschr.*, 1883, p. 865.

† Virchow's *Archiv*, Bd. c. p. 262.

‡ See author's work on "Tumours."

§ *Lancet*, 1871, vol. ii. p. 431.

with several smaller ones attached, and of a mass of white cheesy matter, mixed with numerous thin, colourless, curly hairs, which on microscopical examination presented the appearance of encephaloid. At the autopsy cancerous deposits were found in the liver, right suprarenal capsule, and mesenteric glands.

The meagre facts of this isolated case must make us pause before questioning the innocency of ovarian dermoids. In the first edition of this work I thought the facts pointed in the direction of occasional malignancy, but four years' further study of the matter in the wards, *post-mortem* room, and laboratory has served to convince me that the innocency of ovarian dermoids cannot be impeached with the scanty and unreliable evidence at present available.

The subject of epithelial infection of the peritoneum will require further consideration in this work in the chapters on Papillary Cysts and Echinococcus Colonies. **Hydroperitoneum** is sometimes associated with an ovarian dermoid: but it is a rare complication except when such a tumour has ruptured into the cœlom.

The ovarian dermoid represented in Fig. 47 I removed from a woman, sixty-three years of age, who was placed under my care on account of rapid enlargement of the belly, furnishing the usual signs of ovarian tumour. On physical examination it was clear that a tumour was present, but that the belly contained a quantity of free fluid as well.

Cœliotomy was performed; when the peritoneum was incised 12 litres of greenish opalescent fluid escaped. A dermoid, the size of a shaddock, was detected buoyed up by the fluid. Its pedicle was secured and the tumour removed. Convalescence was satisfactory.

The tumour was a typical dermoid, its biggest loculus containing the usual pultaceous matter and a ball of brown hair. The walls of the loculus were quite bald (baldness of dermoids in elderly individuals is a circumstance I have mentioned previously, *see* page 64). Jutting from the walls of the dermoid was a glandular mass the surface of which presented numerous small cysts and depressions. These cavities were lined with epithelium, and an examination proved that the secretion from these glandular spaces escaped into

the peritoneal cavity (cœlom), and the irritation it caused probably led to a general exudation and produced hydroperitoneum. The capability of glandular secretion to produce hydroperitoneum will be demonstrated in the case of adenoma of the Fallopian tube (chapter xxvii.).

In the preceding chapter each constituent of ovarian dermoids was considered in some detail, and it is a circumstance of great importance for the student to recognise that

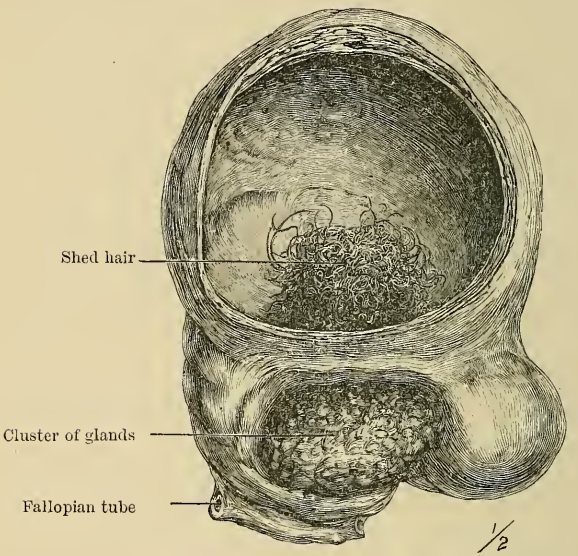

Fig. 47.—Ovarian Dermoid from a Woman Sixty-three Years of Age. The walls of the loculus were bald.

all the curious structures found in them are products peculiar to skin or mucous membrane. Organs such as liver, kidney, and intestine; or limbs and bones of definite shape, such as the femur, humerus, vertebræ, or skull bones, are never found. This fact serves sharply to distinguish dermoids from teratomata which are derived from suppressed embryos.

Confusion has occasionally been introduced when a careless observer has mistaken a lithopædion, the result of a tubal pregnancy, for a dermoid. On the other hand, ovarian dermoids have been mistaken for the products of what used to be vaguely called "extra-uterine gestation."

Ovarian dermoids have also been regarded as a kind of imperfect pregnancy. It is, however, open to anyone possessing average patience, ordinary capacity for observation, and the usual training in histology, to demonstrate to his own satisfaction that the epithelium of the ovarian follicle is the source of all the structures found in ovarian dermoids, and that such curious expressions as parthenogenesis; imperfect conceptions; *lucina sine concubitu;* excess of formative energy, etc., which have encompassed this question with such clouds of mystery, must yield to deductions from accurately observed facts.

CHAPTER XI.

ON THE DIMENSIONS AND RATE OF GROWTH OF OVARIAN TUMOURS.

Concerning the rate of growth of tumours peculiar to the oöphoron, very little accurate evidence is forthcoming; it may be useful to summarise this limited knowledge. Much of our ignorance is due to the fact that ovarian (and parovarian) cysts which attain very large dimensions are of such gradual

Fig. 48.—Yü Yung Nē before Operation. (After *Elizabeth Reifsnyder.*)

and insidious growth that the patients are rarely aware of "anything being wrong" until the unusual size of the belly or the incidence of some complication leads them to seek advice.

Simple unilocular cysts attain enormous sizes, and one of the most striking facts connected with these big cysts is this: Although the intra-cystic pressure is very high, and the cyst wall extremely tense, yet fluid continues to accumulate within the cyst until it amounts to 40, 50 or 60 litres.

A very big cyst has recently been reported from China.* A patient, Yü Yung Nē, twenty-five years of age, was submitted to ovariotomy by Dr. Elizabeth Reifsnyder. The cyst yielded 100 litres of fluid, and the sac weighed 3 kilogrammes, so that

* *American Journal of Obstet.*, vol. xxxi. p. 512.

at a moderate estimate the cyst and contents weighed 103 kilogrammes. The patient recovered, and this enterprising lady missionary at Shanghai has successfully removed one of the largest ovarian cysts on record (Figs. 48 and 49).

Fig. 49.—Yü Yung Nē after Operation. (After *Elizabeth Reifsnyder.*)
The skin of the belly is thrown into pleats.

Dr. Alonzo Garclon* removed from a woman, twenty-eight years of age, an ovarian cyst from each ovary, the total weight being about 80 kilogrammes. The belly was so pendulous that it reached the knees and became chafed. The patient

* *American Journal of Gyn. and Obstet.*, 1895 p. 448.

did not survive the operation. Cullingworth* removed an ovarian cyst weighing 60 kilogrammes, but the patient died.

It is important to remember that some very large examples of ovarian cysts have occurred in girls, and, in some of the cases, in tables B and C, pages 176 and 177, the cysts were of almost incredible size.

Dayot has recorded the details of a successful ovariotomy in a girl seventeen years old, in which the cyst contained nearly 78 litres of thick fluid. In this girl the tumour had been noticed three years (Fig. 50).

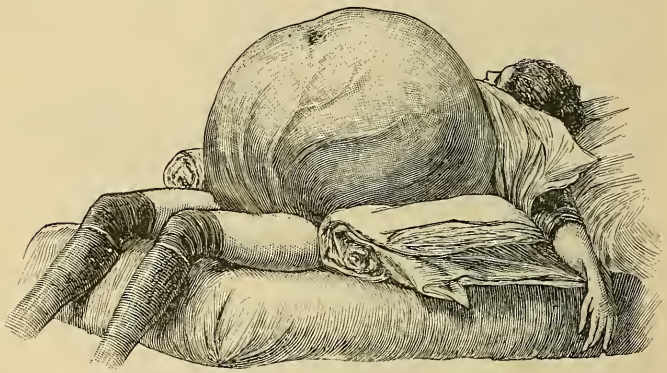

Fig. 50.—Enormous Ovarian Cyst in a Girl Seventeen Years of age ; it contained 78 litres of fluid. (After *Dayot.*)

In 1894 a case came under my notice which illustrates very well the occasional rapid growth of ovarian cysts. A married woman, thirty years old, found herself growing unduly stout, and, as it was associated with amenorrhœa, regarded herself pregnant. She engaged doctor and nurse. When near the time of delivery, according to her reckoning, dispositions were made for the confinement and the nurse was installed. Five weeks passed but there were no signs of the advent of the baby ; an ovarian cyst was suspected and I was asked to see the case. It was a typical ovarian cyst reaching far above the navel; a small uterus was easily detected. Ovariotomy was successfully carried out.

Ovarian tumours, even the complex dermoids, occasionally arise and grow with great rapidity. Of the three varieties of

* *Lancet*, 1891, vol. i. p. 999.

tumour peculiar to the oöphoron—simple cysts, adenomata, and dermoids—I have been able to obtain definite observations concerning each which will serve to demonstrate what would be inferred, that simple cysts grow with far greater rapidity than adenomata and dermoids.

1. *Simple Cyst.*—In May, 1892, Dr. Butler Smythe removed from a woman an ovarian (oöphoronic) cyst containing 20 litres of fluid; during the operation the opposite ovary was examined and found to be normal in appearance and in size. In the following November pregnancy was recognised, and delivery at term occurred in July, 1893. In the following September an ovarian tumour was detected and ovariotomy performed a second time in October, 1893. The cyst contained 18 litres of fluid. We know from many recorded cases that there is nothing unusual in 20 litres of fluid accumulating in an ovarian or a par-ovarian cyst in a few months after spontaneous rupture or tapping, but I am unacquainted with any other case in which a cyst, containing so large a quantity of fluid, arose and attained such proportions in an ovary known by actual inspection to be of normal size seventeen months previously. That the ovary was capable of discharging its function subsequent to the first ovariotomy is proved by the most positive of all evidence—viz. that the woman became pregnant.

This case clearly demonstrates that *a cyst may arise in a healthy ovary and attain a dangerous size within seventeen months.*

2. *Ovarian Adenoma.*—In August, 1891, I removed from a single woman forty-eight years of age a large adenoma of the left ovary; a loculus of the tumour had burst, probably some weeks prior to the operation, and a large quantity of colloid stuff had accumulated in the abdominal cavity. During the operation the right ovary was inspected; it corresponded in size and appearance to the ovary of a woman at the menopause. The patient had ceased to menstruate a year previously.

During the three succeeding years this woman followed her occupation, that of a cook, without let or hindrance. In February, 1895, whilst vomiting, she felt sudden pain in her belly, and subsequently noticed herself become unduly stout. Two months later she sought my advice, and on examination

I detected an ill-defined tumour. She was admitted into the Chelsea Hospital for Women, and I performed ovariotomy. On incising the parietes, a large quantity (4 litres) of thick jelly-like stuff was encountered and removed; then the shrunken remnant of the tumour, which proved to be an adenoma of the right ovary, was drawn out, ligatured, and removed. The remains of the colloid tissue were washed out with a full stream of water at 110° F. Recovery was rapid and complete. In this instance we have positive evidence that *a complex glandular tumour, containing at least* 4 *litres of colloid stuff, may grow from an ovary of natural size within a space of forty months.*

3. *Ovarian Dermoid.*—The following case is recorded by Flaischlen:—In May, 1887, Ruge ovariotomised a woman, removing a cyst as large as a child's head which had arisen in the left ovary. The right ovary was inspected and found to be natural.

In June, 1888, a tumour the size of a fist was detected on the right side of the pelvis. In December, 1890, laparotomy was again performed, and a dermoid, containing hair and teeth, removed.

In this case the evidence is decisive that *a dermoid may arise in the ovary and attain dangerous proportions in an adult woman within the space of three years.*

That a tumour containing hair and erupted teeth should be produced in the course of three years is not inconsistent with the rate at which these organs are formed under normal conditions. For instance, the period between the fertilisation of an ovum and the eruption of the milk incisors in man is about fifteen months; in exceptional instances children are born with incisors above the gum. In such cases the process occupies less than nine months.

The facts in Ruge's case throw some light on the instances of double ovariotomy during pregnancy in which both ovaries were metamorphosed into dermoids, and the surgeons have been puzzled that ovaries in such a condition should be capable of yielding eggs. It is not improbable that the conversion of the ovaries into dermoids was coincident with, and perhaps in a measure encouraged by the concurrent pregnancy.

CHAPTER XII.

CYSTS OF THE PAROÖPHORON AND GARTNER'S DUCTS. WARTY OVARIES.

It has already been pointed out that the ovary consists of two distinct parts: the **oöphoron** and **paroöphoron.** The latter contains remnants of the **mesonephros** (Wolffian body) in various stages of degeneration. Usually, the paroöphoron in the adult consists of fibrous tissue permeated by blood-vessels, and receives the vertical tubules of the parovarium. In the fœtus at birth, and occasionally in young subjects, it retains, in a measure, its original tubular character. In such specimens the structural differences of the two parts of the ovary are very striking.

The cysts which arise in the paroöphoron are, as a rule, unilocular, and differ from those arising in the oöphoron in the following particulars:—

(1) They do not affect the shape of the ovary until they have attained an important size.

(2) They always burrow between the layers of the meso-salpinx, and when large make their way between the layers of the mesometrium by the side of the uterus.

(3) The interior is beset with warts.

(4) They are most frequent between the twenty-fifth and fiftieth years.

The warts in such cysts vary greatly in number. Sometimes only a few clusters are present, but in others they are so luxuriant as to cause the cyst containing them to rupture.

These warts are very vascular, bleed freely when handled, and are frequently calcified.

Coblenz* was the first clearly to identify and distinguish these cysts from those arising in the parovarium and

* Virchow's *Archiv*, Bd. lxxxiv. p. 26.

associate them with definite structures. His observations have been largely confirmed by Doran,* who has devoted great attention to this question.

On one occasion, whilst examining sections of the ovaries of a seventh-month fœtus, Doran detected in one of them three small cysts, almost of equal size, lying in a row along its long axis, and plainly visible to the naked eye, which could also detect exuberant vegetations growing from their walls. The cysts were almost perfectly spherical, and had a diameter of 2 mm. When these cysts were examined under the microscope the branched processes sprouting into them were seen to be covered with columnar epithelium; these processes were, in structure, warts. After a careful and detailed description of these ovaries, Doran came to the reasonable conclusion that the small cavities were incipient papillomatous cysts of the paroöphoron. The original description of this important specimen is illustrated by a photograph of one of the sections.

In 1886 I examined, microscopically, a large number of ovaries obtained from human fœtuses, and on one occasion found a cyst somewhat smaller, but identical in its situation and characters with those described by Doran.

The distinguishing feature of these paroöphoronic cysts is that they contain *papillomata; but all papillomatous cysts of the ovary are not paroöphoronic in origin.* It will therefore be convenient in this chapter to consider the subject of warts in relation to the ovary. A paroöphoronic cyst may contain one large tuft surrounded by a few scattered nodules, whereas in another example the cavity of the cyst may be so stuffed with them that it bursts.

The museum of the Royal College of Surgeons, London, contains an admirable specimen illustrating this. It is sketched in Figs. 51 and 52. It is thus described in the catalogue:—"An uterus with its appendages. A mass of finely lobulated and pedunculated growths springs from the site of each ovary, the substance of which, with follicles, was discovered on close search at the roots of the growths.

* Trans. Path. Soc., vol. xxxii. p. 147.

These growths were probably enclosed at an early stage in a cyst wall."

The parts were removed, after death, from the body of a young lady who died of some visceral affection.

It is a matter of regret that more facts are not forthcoming regarding the clinical signs. There can be no doubt that the opinion expressed in the catalogue that the growths

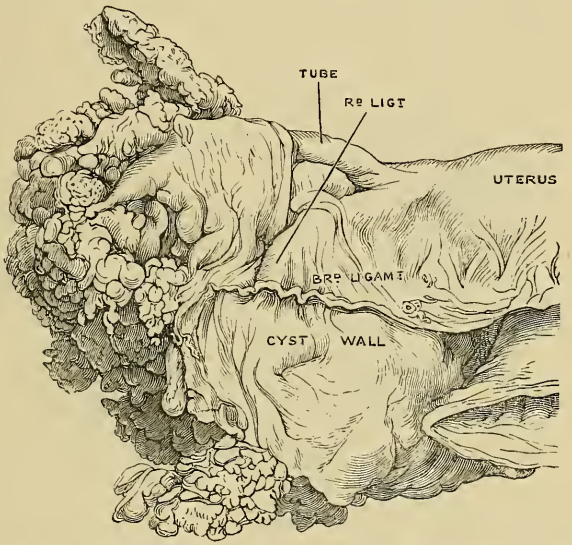

Fig. 51.—Ruptured Papillomatous Cyst (right half of the specimen). (Museum, Royal College of Surgeons.)

were probably enclosed, at an early stage, in a cyst is correct, for the following reasons:—

(1) The characters of the papillomatous masses exactly correspond to those found in cysts of the paroöphoron.
(2) The ovary is partially absorbed by the tumour.
(3) Remnants of the cyst wall are still present in the specimen.

A distinction must be drawn between rupture of the cyst and perforation of the cyst wall by the papillomata. In the latter condition, cauliflower-like masses of warts project from the surface of the cyst into the abdominal cavity: sometimes at one spot, sometimes in three or four places. In the specimen mentioned above, the cysts have

ruptured, for it will be seen, on reference to Fig. 51, that the parts have been beautifully prepared and dissected, and that the anterior layer of the mesometrium is sharply indicated; below this the true cyst wall is easily recognised on the right side.

The papillomata in these cysts, when they form such large dendritic masses, are very vascular, and easily bleed when manipulated. The cells are usually spheroidal in shape, and

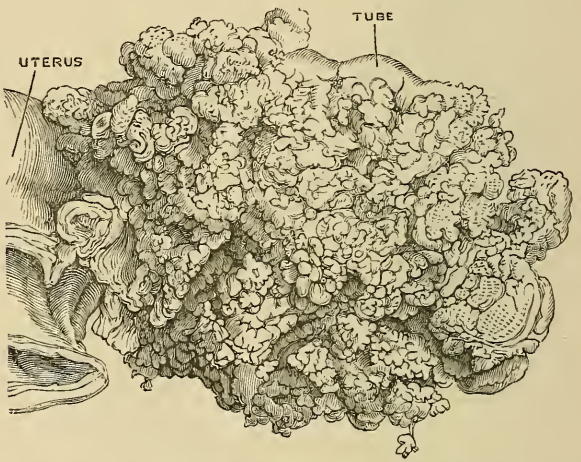

Fig. 52.—Ruptured Papillomatous Cyst (left half of the specimen). (Museum, Royal College of Surgeons.)

the stroma is very scanty. Frequently the warty masses undergo calcification.

An important pathological and clinical fact connected with these cysts is, that when they rupture the fluid they contain is scattered broadcast over the peritoneum.

When there is general epithelial infection of the peritoneum, the warts are most numerous on the serous membrane lining the recto-vaginal pouch, and on the omentum and mesentery.

It has been clearly established that when the abdomen has been opened for the removal of a papillomatous cyst, the peritoneum has been found studded with warts. A few years later the abdomen has been reopened and all the peritoneal warts have disappeared. Thus they behave like warts on the

skin. This fact must be borne in mind, or the operator will hastily assume the disease to be malignant when he finds general peritoneal infection.

The disappearance of peritoneal warts after removal of the primary tumour is an interesting fact, and may be probably explained in this way:—The life of multiple warts is often very transient, and this is probably the case with peritoneal papillomata: but as long as the seed supply continues new warts spring up, last for a time, and die, to be succeeded in their turn by a new crop. When the source of epithelium is removed by operation, the warts then existing die, and the crop of warts is not renewed. Exceptionally these papillomatous cysts rupture into the connective tissue of the mesometrium, and I have seen them clustering around the urachus as high as the umbilicus.

The dispersal of germinating cells from these emancipated warts is, no doubt, largely effected by movements of the intestines, in addition to the sudden inundation of the belly when the cyst bursts; but there is an additional complication which not only favours epithelial infection, but is in itself inimical to life—namely, **hydroperitoneum.** This condition differs from ascites in the circumstance that it is not the consequence of hepatic, cardiac, or renal disease, but is due to irritation of the peritoneum by secondary nodules of cancer, warts, tubal disease, and the like. Hydroperitoneum is a constant concomitant of the bursting of a papillomatous cyst. When the cyst is removed the exudation ceases. It is important not to mistake tiny nodules secondary to ovarian sarcomata for warts.

The wart-covered ovary (Fig. 53), with a companion three times its size, I removed from a woman thirty-five years of age, whose belly contained many litres of fluid. The pelvic peritoneum was luxuriant with warts. She recovered rapidly. This was in January, 1892. The woman is in good health, and the hydroperitoneum has not returned (1895).

One of the most remarkable examples of hydroperitoneum associated with papillomatous cysts on record is that described by Dr. Pye-Smith.* In this case a woman was tapped for

* Trans. Path. Soc., vol. xliv. p. 111.

hydroperitoneum between August, 1884, and April, 1894, 299 times. On readmission for the 300th tapping she died. At the *post-mortem* examination a papillomatous cyst was found in connection with each ovary. The peritoneum was beset with warts. This extraordinary case may be read with profit in conjunction with those on pages 132 and 133.

Hydroperitoneum is further discussed in chapter xliv.

When papillomatous cysts are of moderate size, and have

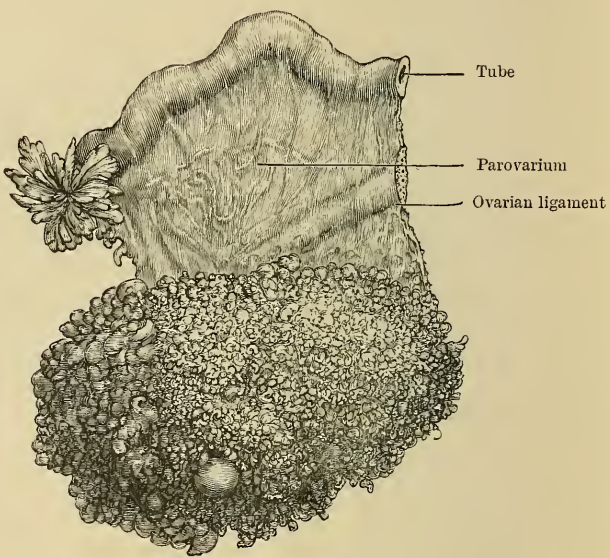

Fig. 53.—Ruptured Papillomatous Cyst. ($\frac{1}{2}$)

not burrowed deeply, they may be removed as easily as parovarian cysts.

Gartnerian Cysts.—A larger experience of ovarian and parovarian cysts has served to convince me that many papillomatous cysts have an origin independent of the paroöphoron. A careful study of the relations of these cysts shows that many of them burrow deeply by the side of the uterus, and even extend along the wall of the vagina.*

It is known that Gartner's duct occasionally persists in women and, after leaving the parovarium, it traverses the

* Amand Routh gives an admirable summary of the literature of Gartnerian cysts in Trans. Obstet. Soc., vol. xxxvi. p. 152.

layers of the mesometrium, and runs down the side of the uterus to reach the vagina. As it approaches the cervix,

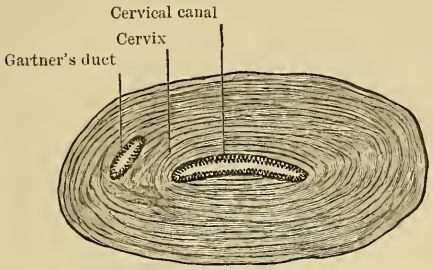

Fig. 54.—Transverse Section through the Middle of the Cervix of a Fœtal Uterus, with persistent Gartner's Duct. Slightly magnified. (*Rieder.*)

it is often embedded in the tissue of this part of the uterus (Fig. 54).

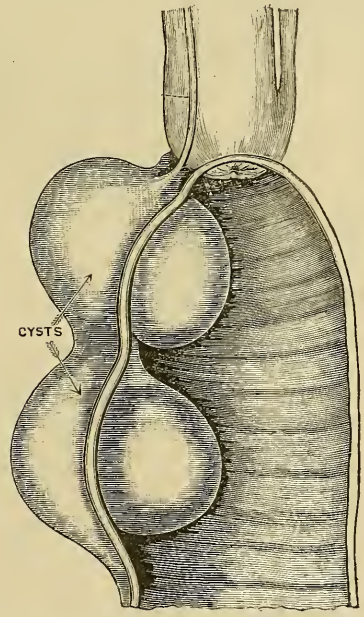

Fig. 55.—Uterine Segment of a Cow's Vagina showing two large Cysts developed in the terminal Segment of Gartner's Duct.

Evidence is slowly accumulating in support of the opinion that some papillomatous cysts of the mesometrium, especially

those which burrow deeply by the side of the uterus, arise in persistent portions of Gartner's duct, near its termination.

Cysts of this character which burrow deeply often entail risk in removal, as they lie in intimate relation with uterus, ureter and bladder: the cyst when large will come in contact with the iliac arteries and veins at the brim of the pelvis, and even rest upon the inferior vena cava.

The cystic tendencies of Gartner's duct can easily be studied in cows. In these animals the ducts are sometimes as large as crow-quills. Usually they become gradually lost

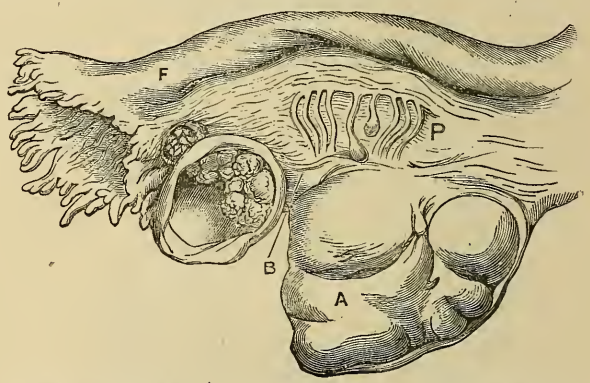

Fig. 56.—A, Ovary; P, Parovarium; F, Fallopian Tube; and B, Mesosalpinx. Natural size. Two small papillomatous cysts are seen in relation with the tubo-ovarian ligament.

on the sides of the uterus, but occasionally they may be traced to the vagina. The evidence that these ducts are the source of cysts is not merely circumstantial. In the specimen represented in Fig. 55 the vaginal segment of the duct is expanded and forms two cysts, each large enough to accommodate a hen's egg.

Gartnerian cysts arising in the terminal segment of the duct project into the vagina. In some instances these cysts may be treated surgically through the vagina with greater success than by cœliotomy.

Warty Ovaries.—There is a variety of papillomatous cyst arising in the mesosalpinx independently of the ovary or Gartner's duct. These cysts are usually found near the junction of the tubo-ovarian ligament with the ovary, and burrow between the layers of the mesosalpinx (Fig. 56).

When fresh they are transparent, and resemble incipient parovarian cysts, but they are unconnected with this structure. The most striking feature of these cysts is the almost

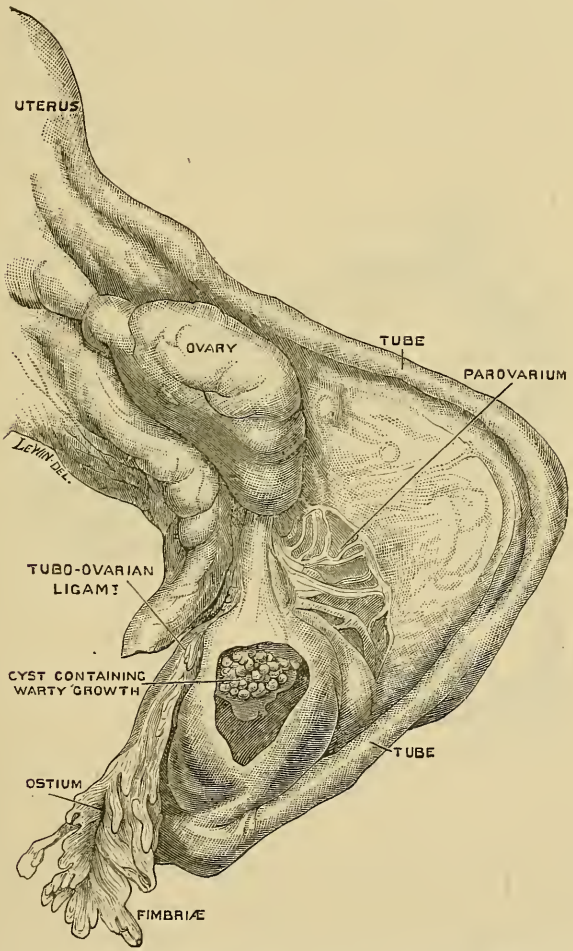

Fig. 57.—Warty Cyst burrowing between the Layers of the Mesosalpinx along the Tubo-ovarian Ligament. Natural size.
The tube is 17 cm. in length.

invariable presence of a tuft of warts. It is difficult to be sure of the presence or absence of these warts without opening the cyst. These warts are composed of very dense fibrous tissue. In this respect they differ in a striking manner from

the soft vascular papillomata found in the cysts considered in the first part of this chapter.

It is rare that these cysts are big enough to cause symptoms, but it is clear that when one attains the size shown in Fig. 57 and leads to such elongation of the tube and ovarian ligament, twisting of the pedicle is a possibility. It is also certain that if a patient with a cyst of the size shown in Fig. 57 complained of pain and submitted to physical

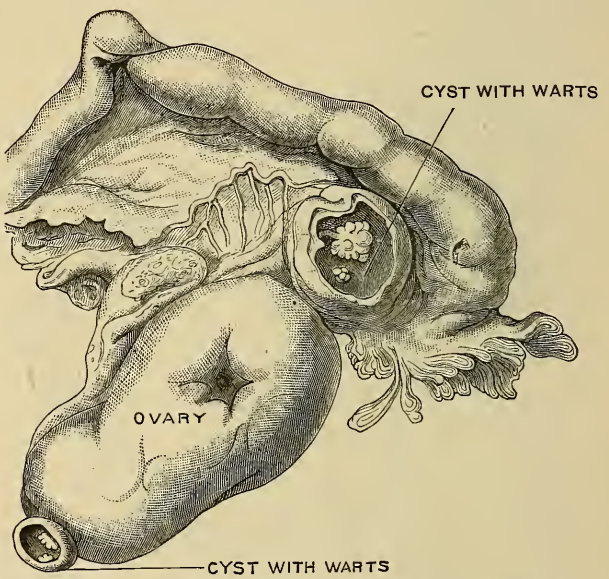

Fig. 58.—Ovary and related Structures. A small papillomatous cyst occupies the mesosalpinx.

examination, it would be detected by an experienced gynæcologist. I have examined one specimen which was removed on account of the painful symptoms it produced. Nearly all my knowledge of these cysts is founded on examples detected accidentally in the dead-house.

It is a point of interest, as regards their origin, that similar wart-containing cysts may sometimes be found in relation with the free surface of the ovary (Fig. 58). I have seen ten of these small cysts in one ovary. It is also known that the surface of an ovary, especially when the uterus contains myomata, is apt to be occupied by a crowd

of sessile, wart-like bodies of cartilaginous hardness; and I have seen a cyst burrowing along the tubo-ovarian ligament, associated with warts on the ovary, some of which were furnished with a capsule and others free. Of the cause and the significance of these hard wart-like bodies I am quite ignorant.

CHAPTER XIII.

PAROVARIAN CYSTS.

The parovarium consists of a series of narrow tubules situated between the layers of the mesosalpinx and closely associated with the paroöphoron. It is easily seen, when the mesosalpinx is stretched and held between the eye and the light, as a series of tubules radiating from the ovary to join a longitudinal tubule situated at a right angle to them. Although the tubules converge as they approach the ovary, nevertheless they remain distinct. Each tubule ends blindly, and is usually lined with epithelium. In form, size, and disposition they resemble the arrangement of the vasa efferentia of the testis. This resemblance was observed by Rosenmüller, who discovered this structure in 1801 whilst prosecuting anatomical researches at Erlangen. The parovarium is homologous with the vasa efferentia and epididymis of the testis, for these tubular structures in the male and female are the persistent excretory ducts of the Wolffian body (mesonephros). In the female they are vestigial, whereas in the male they are functional.

When present in its typical condition, the parovarium consists of three parts (Fig. 59): an outer series of tubules, free at one extremity, known as Kobelt's tubes; an inner set, termed the vertical tubules; and there is a larger tube running at right angles to the vertical tubules which may occasionally be traced downwards to the vagina. This is Gartner's duct; it corresponds to the vas deferens in the male. The parovarium contains, as a rule, twelve tubules; sometimes as many as seventeen may be counted, and in other specimens as few as five.

The cysts that arise in the parovarium are of two kinds. The most frequent are small pedunculated cysts connected with Kobelt's tubes. They rarely exceed a pea in size, and do not call for much comment, as they are of no clinical importance. They need to be mentioned, however, because

they are often confounded with the hydatid of Morgagni. The distinction between the two structures is given on page 195. Occasionally, some of the vertical tubules will break loose and form pedunculated cysts. Should the cyst rupture, it may be converted into a tuft of fimbriæ. The most important cysts are sessile, and remain between the layers of the mesosalpinx. In the early stages it is easy to demonstrate the relation of these cysts to the parovarium. When such a cyst enlarges, it burrows between the layers of the

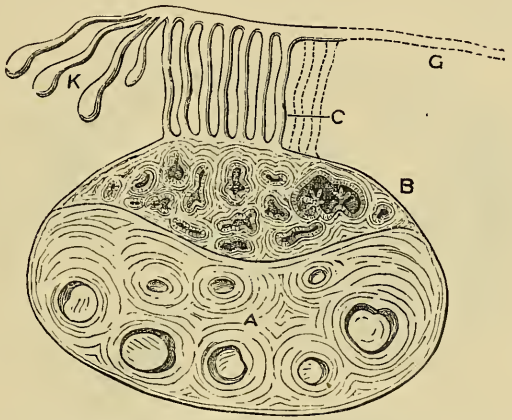

Fig. 59.—Parovarium (semi-diagrammatic).
A, Oöphoron ; B, paroöphoron ; K, Kobelt's tubes ; C, vertical tubes of the parovarium ; G, Gartner's duct.

mesosalpinx and makes its way towards the Fallopian tube, which becomes stretched, because the abdominal end of the tube is fastened firmly to the ovary by the tubo-ovarian ligament, and the ovary in its turn is attached to the side of the uterus. In a very large cyst the Fallopian tube becomes greatly elongated ; I have known it attain a length of 40 cm. In spite of this extreme stretching, the lumen of the tube is rarely obstructed, and its abdominal ostium can usually be found, the fimbriæ being indicated by a few wattle-like processes (Fig. 60).

Small cysts are, as a rule, transparent, but when they exceed the size of a cocoanut this transparency is lost, and the walls become thick and tough. Small parovarian cysts

are lined with columnar epithelium, which is sometimes ciliated; in cysts of moderate size the epithelium becomes stratified, and in large cysts it atrophies from pressure.

The fluid they contain is limpid and slightly opalescent; specific gravity 1002 to 1007, reaction slightly alkaline. A substance, precipitated by alcohol, is present in large quantity.

In big cysts the fluid is often turbid and may contain cholesterine. When parovarian cysts rupture into the cœlom (peritoneal cavity) the fluid is quickly absorbed and excreted by the kidneys.

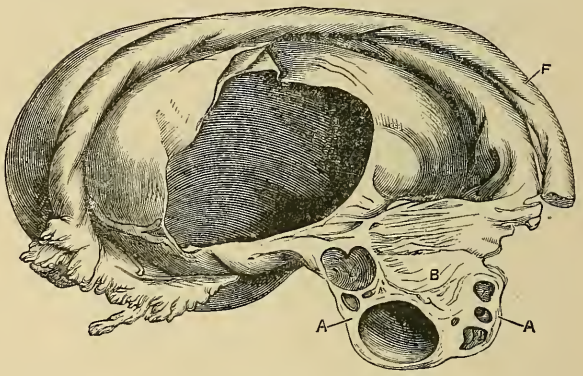

Fig. 60.—Cyst of the Parovarium, showing its relation to Ovary and Tube. Two-thirds its natural size.
A, Oöphoron; B, paroöphoron; F, Fallopian tube.

The points which enable a large parovarian cyst to be distinguished from an oöphoronic cyst are these:—

1. The peritoneal coat is easily stripped off.
2. The ovary is usually found attached to the side of the cyst.
3. The cyst is usually unilocular.
4. The Fallopian tube is stretched over the cyst, and never communicates with it.
5. The specific gravity of the fluid does not exceed 1010, and may be much lower.
6. In some specimens the tissue of the mesosalpinx is greatly thickened.

It was formerly believed that cysts originating in the

parovarium rarely exceeded the size of an orange, but in 1873 Dr. Bantock* demonstrated beyond any doubt that parovarian cysts may attain very large proportions, and be capable of containing several litres of fluid. The largest parovarian cyst which has yet come under my care contained 20 litres of turbid fluid. The patient was forty-eight years of age, and though she was very stout never suspected anything was wrong in her belly (an opinion which her husband shared) until her left leg became œdematous. I removed the cyst, and the patient rapidly recovered. The chief rules laid down by Dr. Bantock to serve for the recognition of parovarian cysts are those given above. The conclusions arrived at by this surgeon have been confirmed by subsequent investigators; and there can be no doubt that in the lists of ovariotomists many of the so-called unilocular cysts of the ovary were parovarian in origin. My own observations on recent and old museum specimens serve to convince me of this fact, and of the correctness of Dr. Bantock's conclusions.

The age at which parovarian cysts occur is of some interest. It has already been mentioned that cysts of the oöphoron are encountered at any period, from fœtal life up to extreme old age. The occurrence of a parovarian cyst has not, as far as I am aware, been recorded in an individual before the age of sixteen. I have collected many undoubted cases at seventeen, eighteen, and nineteen, the cysts being large enough to rise above the pubes. Before sixteen the parovarium appears to be quiescent, but on the advent of puberty it seems to undergo great stimulation. A very large proportion of cysts, generically classed as ovarian, removed between the ages of seventeen and twenty-five, arise in this interesting structure.

In 1894 Dr. Heywood Smith removed from a girl in her sixteenth year a parovarian cyst containing many litres of fluid. I was present at the operation. Puberty occurred early in this girl; she began to menstruate at the age of ten years.

It is difficult to come to any satisfactory conclusion as to the relative frequency of parovarian as compared with cysts of the oöphoron and paroöphoron, until operators become less

* "On the Pathology of certain so-called Unilocular Ovarian Cysts," in Trans. Obstet. Soc. Lond., vol. xv. p. 105.

casual in their use of the term "ovarian cyst." With our present knowledge they form about 10 per cent.

Parovarian cysts do not often contract adhesions, even when

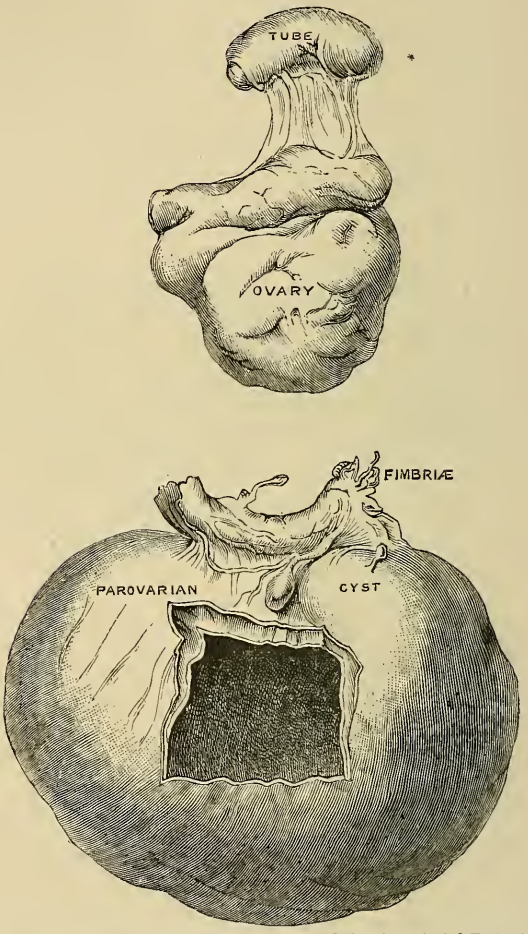

Fig. 61.—Ovary and Stump of a Fallopian Tube, left after Axial Rotation, ending in complete detachment of a Parovarian Cyst. (Dr. Walter's case.)

* The rounded stump of the tube at the point of detachment.

they suppurate. The layers of the mesometrium stretched over them occasionally contain an unusually large proportion of unstriped muscle-fibre. Parovarian cysts rarely suppurate, even when tapped, and as this procedure cannot be depended

upon to cure them, it is now abandoned as unsatisfactory, apart from its risks. Like other forms of cysts and tumours related to the ovary, they are liable to axial rotation and complete detachment. An example of this is illustrated in Fig. 61.

The parts were removed by Dr. Walter, of Manchester, and he kindly placed them in my hands for examination. The cyst is clearly parovarian, and is embedded in the mesosalpinx. The fimbriated end of the tube and a small pedunculated cyst are connected with it. The cyst was adherent to the back of the uterus. The veins in the corresponding mesometrium were varicose. For fuller details relating to axial rotation of cysts and tumours, *see* chapter xvi.

Epithelium.—It was formerly the custom to believe in the immutability of epithelium; hence many writers have relied upon the characters of the epithelial lining of cysts as indicative of their origin. Mutation of epithelium has been proved so often that it is needless to do more than mention that in some parovarian cysts ciliated cells will be found; in others simple cubical, and in many large cysts no epithelium can be detected. Undoubted parovarian cysts sometimes present low flat-topped warts.

CHAPTER XIV.

OVARIAN HYDROCELE.

Attention has already been drawn to the fact (*see* page 51) that in the case of an ovarian tumour the Fallopian tube is separated from the ovary by the mesosalpinx: the tube usually lies curled up by the side of the cyst, but it may, especially in the case of a solid tumour, be stretched by it.

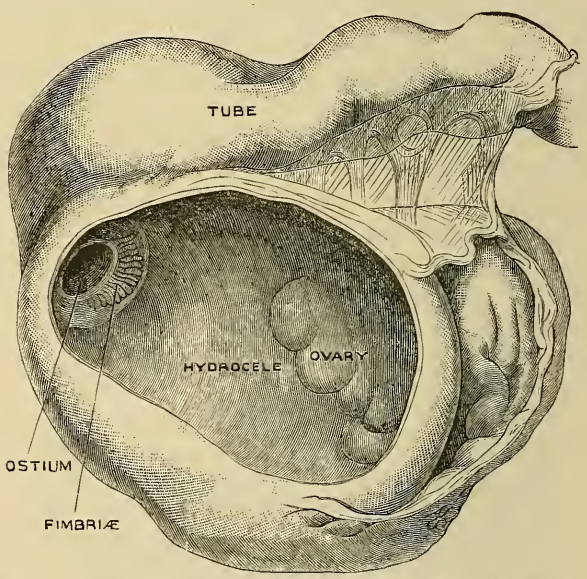

Fig. 62.—Ovarian Hydrocele. Natural size. (Dr. Walter's specimen.)

In the case of a parovarian cyst the tube, though it closely embraces the cyst, always remains distinct from it.

In 1853 Richard described, under the term "tubo-ovarian cyst," a variety in which the Fallopian tube opened directly into the cavity of a cyst by a large circular or elliptical aperture, representing the abdominal orifice of the tube.

Tubo-ovarian cysts have been described several times since Richard drew attention to them. These descriptions have been collected and analysed by Dr. Griffith.

The characters of this form of cyst are represented in Fig. 62. The specimen came into my hands in a recent condition, and on reference to the sketch it will be noticed that the tube is widely dilated towards its ampulla, and then opens by a wide orifice into an oval cyst the size of an egg. Projecting into the floor of the cyst is a portion of the ovary; the remainder of the ovary, though adherent to the cyst wall, lies outside the cyst, and presents a recent corpus luteum. The cyst wall was directly continuous with the mesometrium. On examining the orifice by means of which the tube and cyst communicated, small atrophied, but unmistakable, Fallopian fimbriæ were found.

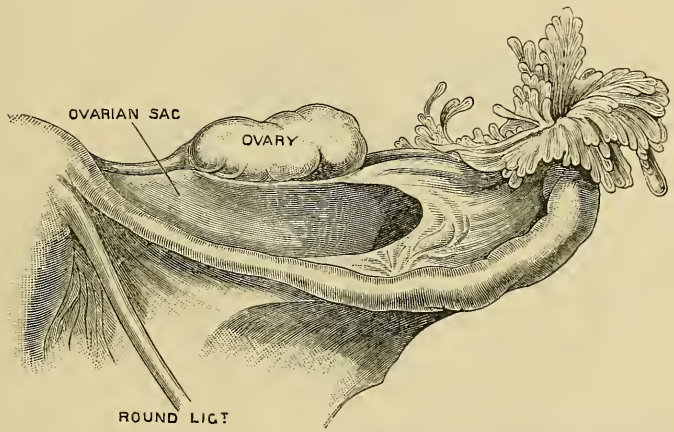

Fig. 63.—Ovarian Sac or Recess on the posterior Aspect of the Mesometrium (human). (Modified from *Richard.*)

An extended study of "tubo-ovarian cysts" as defined by Richard shows that three separate conditions have been, and are apt to be, confounded.

(*a*) Inflammatory fusion of the Fallopian tube and ovary (Fig. 93).

(*b*) A very large hydrosalpinx.

(*c*) A condition which I have ventured to term **ovarian hydrocele,** because there is reason to believe that it arises in connection with a tunic of peritoneum which occasionally invests the human ovary, much in the same way that the funicular pouch of peritoneum clothes the testicle.

We must, in order to appreciate ovarian hydroceles, deal with a few points concerning the peritoneal relations of the ovary.

The ovary projects from, and is invested by, the posterior layer of the mesometrium. When the parts are examined *in situ*, the ovary will be found to lie in, or upon, the edge of a shallow recess in the mesosalpinx. This recess is the ovarian sac. It varies in depth: in many it is small and inconspicuous, whilst in others it is sufficiently deep to accommodate the entire ovary. In the virgin the ampulla of the tube falls

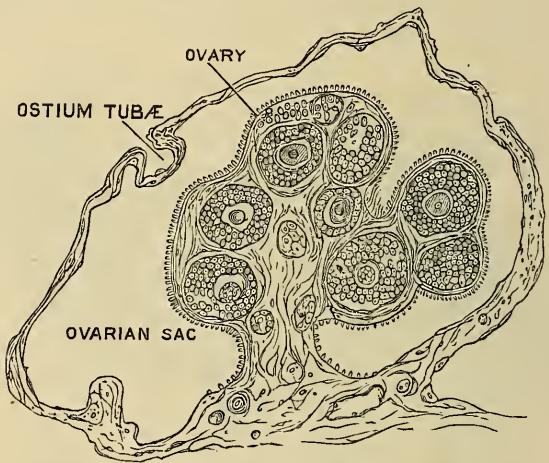

Fig. 64.—Transverse Section of the Ovary and Sac of a Mouse. (After *Robinson*.)

over the mouth of the recess and conceals the ovary. This relation of parts is usually disturbed in the first pregnancy. The position of this pouch is shown in Fig. 63. In this drawing the parts are represented as seen from the front, the tube and mesosalpinx being drawn forwards in order to put the parts on the stretch.

In many mammals the ovarian sac is much deeper than in the human female. In such a mammal as the hyæna (*Hyæna crocuta*) it forms a complete tunic to the ovary, and the cavity of the sac communicates with the cœlom by a very small fringed orifice. In rats and mice the sac is complete, so that the ovary is isolated from the cœlom (peritoneal cavity). As the Fallopian tube opens into the ovarian sac, it follows

that in such forms as the hyæna or the tigress the tube opens into the cœlom by way of the ovarian sac. In rats and mice the Fallopian tubes communicate with the ovarian sacs, but not with the cœlom (Fig. 64).

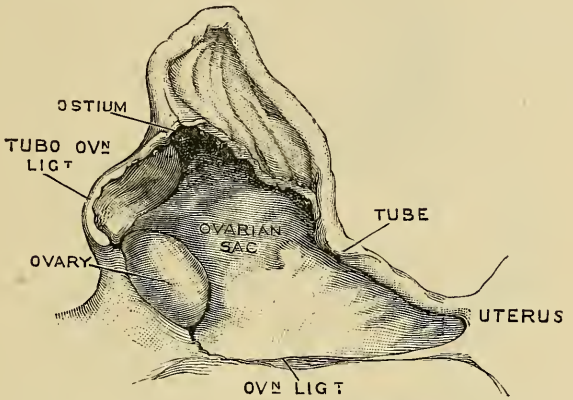

Fig. 65.—Ovarian Sac of a Baboon. (After *Robinson*.)

The sac in some mammals invests the ovary loosely, whilst in others, as the raccoon, it fits it tightly, and corresponds with its eminences and depressions. These ovarian sacs, with the exception of the complete form exhibited by

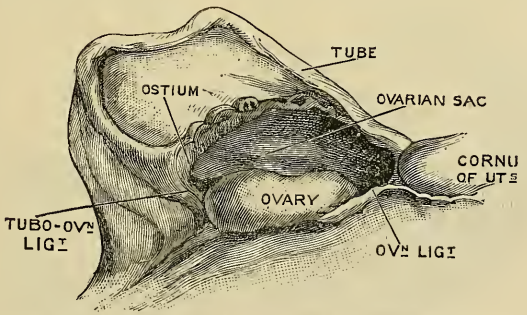

Fig. 66.—Ovarian Sac of a Porcupine. (After *Robinson*.)

rats and mice, have long been known to anatomists, but it remained for Mr. Arthur Robinson not only to detect the complete form, but to demonstrate the manner in which they arise.

Stages in the formation of these sacs, intermediate to the

shallow recess in the human female and the complete pouch of the mouse, may be studied in the baboon and porcupine (Figs. 65 and 66).

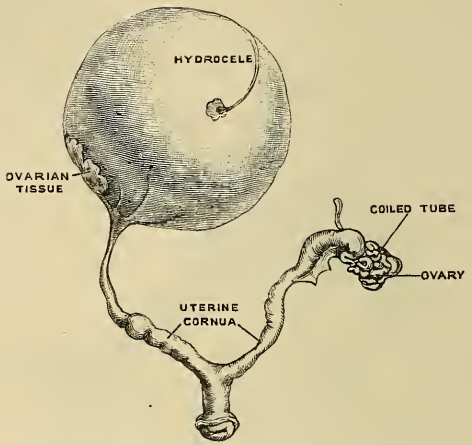

Fig. 67.—Ovarian Hydrocele in a Rat. Natural size.

An examination of the sac in the porcupine shows that when the ovary lies in the recess, the margins of the cavity come into contact; in the figure they are represented widely separate, in order to display the relation of the parts. Should the edges unite, then a complete sac, such as is represented

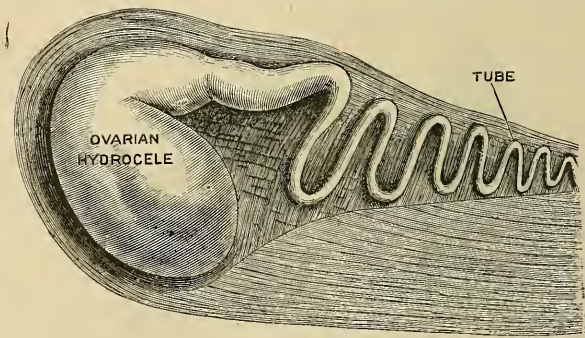

Fig. 68.—Ovarian Hydrocele from a Mare. (After *Schneidemühl.*)

in Fig. 64, would be formed. For full details reference should be made to Robinson's admirable paper.* When the ovary is

* "On the Peritoneal Relations of the Mammalian Ovary": *Journal of Anatomy and Physiology*, vol. xxi. p. 169.

furnished with a complete sac of this kind it resembles the testis, with its tunica vaginalis, except that the Fallopian tube directly communicates with it.

Several examples of ovarian hydroceles in mammals have been observed. The best case which has come under my notice I owe to Dr. Bagot of Dublin. This specimen is depicted in Fig. 67. The Fallopian tube in the rat is coiled between the cornu of the uterus and the ovarian sac, but

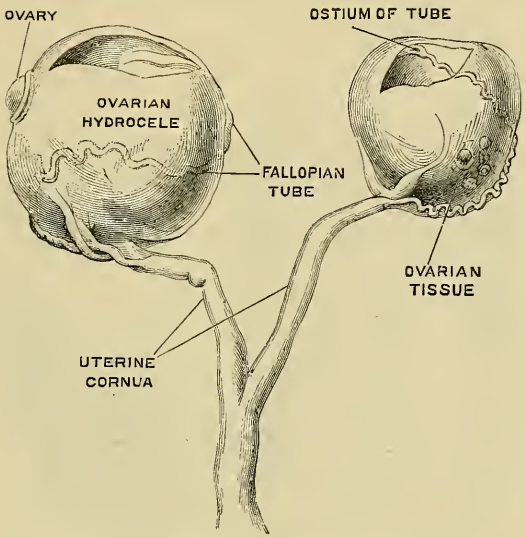

Fig. 69.—Ovarian Hydroceles in a Guineapig.

the sac as it distends uncoils the tube and stretches it around the circumference of the cyst; the tubal ostium opens on the inner wall of the hydrocele and the adjacent section of the tube is dilated. The uncoiling of the tube was well shown in my specimen.

As the ovarian sac is in communication with the uterine cornu, it sometimes becomes implicated in septic conditions of the uterus, and may be found distended with pus. Dr. Robinson has supplied me with ovarian sacs from rats demonstrating this fact.

In addition to rats and mice, ovarian hydroceles have been reported in the mare (Fig. 68) and the guineapig (Fig. 69).

The museum of University College, London, contains a

specimen formerly described as an example of double ovarian cysts in a guineapig. As the peritoneal relations of the ovaries in this rodent are identical with those of the porcupine, I suspected that these supposed ovarian cysts were probably hydroceles. On dissecting the parts, with the permission of the curator, it was easy to determine that the cysts were largely dilated ovarian pouches, and the Fallopian tubes ran round them, the abdominal ends being directly continuous with the sac wall. In the smaller tumour the Fallopian tube

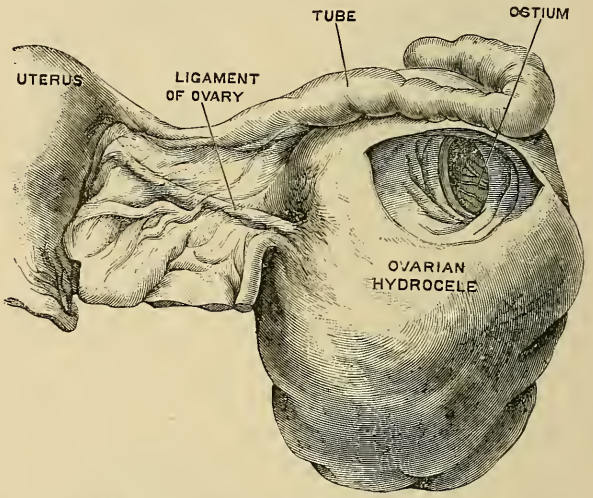

Fig. 70.—Ovarian Hydrocele. (Museum, St. Bartholomew's Hospital.)

dilates as it approaches the abdominal end, and opens by its ostium into the sac. In the larger cyst the orifice is obliterated. The ovaries are cystic, and project into the sacs of the hydroceles.

An excellent specimen of ovarian hydrocele is preserved in the museum of St. Bartholomew's Hospital. It has been described by Dr. Griffith* as a tubo-ovarian cyst, but from his account of the specimen I came to the opinion that it was a hydrocele, and obtained permission to re-examine it.

The uterus and the left ovary and tube are normal.

* "Tubo-Ovarian Cysts": Trans. of the Obstetrical Society, vol. xxix. p. 273, 1887.

† *Zeitschrift für Thiermedecin*, Bd. ix. s. 279.

Projecting from the back of the right mesometrium is a thin-walled unilocular cyst measuring 12·5 cm. by 8·5 cm. The ovarian ligament passes from the uterus to the cyst wall, and at this point ovarian tissue can readily be seen, as Dr. Griffith points out in his original account of the case. The Fallopian tube measures 22·5 cm. in length; its outer third is greatly distended, but the inner two-thirds are not enlarged. The

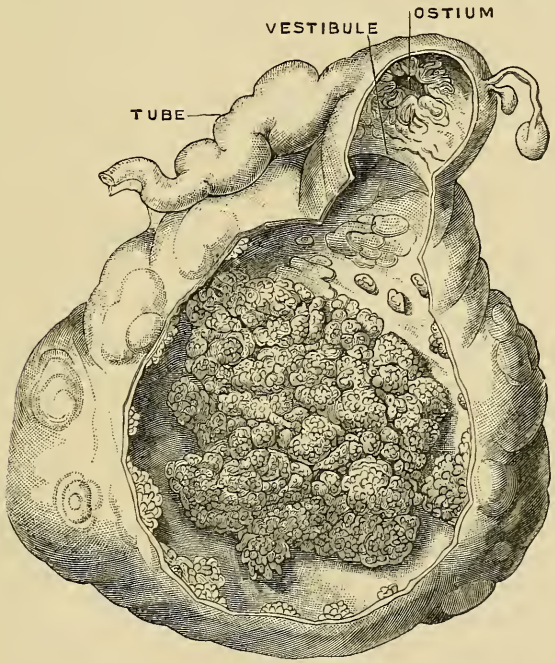

Fig. 71.—Ovarian Hydrocele containing Warts.

abdominal extremity is adherent to the cyst, and communicates with it by a large circular opening 5 cm. in diameter. No traces of the fimbriæ are visible on the inner or outer surfaces of the cyst (Fig. 70).

The contents of the cyst were unfortunately lost, but the fluid was thin, watery, and almost colourless. The specimen has no clinical history, and was removed at the *post-mortem* examination of a woman twenty-seven years of age, who died three years and a half after a severe injury to the spine causing paraplegia. There is no history as to the duration of the cyst.

In one instance I found the interior of a cyst which presented the characters of an ovarian hydrocele beset with warts (Fig. 71). In this specimen there is a kind of vestibule between the tube and the main cyst.

The peculiarities of ovarian hydroceles may be summarised thus :—

(1) The Fallopian tube opens by its abdominal ostium into a sac on the posterior aspect of the mesometrium.

(2) The tube is elongated, dilated and tortuous, and, as Griffith aptly expresses it, the general outline of the parts resembles "*a retort with a convoluted delivery tube.*"

(3) As a rule there is no evidence of inflammation. The cysts may suppurate should the tube become affected with salpingitis.

(4) In small cysts the ovary will be found projecting on the floor of the sac. In larger specimens it will be incorporated with the wall of the sac, and in very large specimens is unrecognisable.

A large hydrosalpinx runs great risk of being confounded with an ovarian hydrocele, especially when the ampulla is acutely flexed upon the uterine half of the tube. In the hydrosalpinx the ovary will invariably be found lying in the concavity formed by the flexure of the tube, and separate, or easily separable, from the dilated tube.

Ovarian hydroceles demand careful study: they cause difficulty in diagnosis, and their appearance puzzles beginners in abdominal surgery, and their successful removal is occasionally an anxious proceeding.

Intermitting Ovarian Hydrocele (*hydrops tubæ profluens*). —There is reason to believe that an ovarian hydrocele, like a large hydrosalpinx, may occasionally intermit: that is, the fluid which it contains sometimes escapes through the tube into the uterus, and is discharged externally. Dr. Barnes mentions a case of this sort which occurred to Mr. Anderson. A woman with an abdominal cyst, waiting to be tapped, suddenly passed what was supposed to be an excessive

quantity of urine. The fluid was found to be albuminous, and contained cholesterine. Six months later she died from hæmoptysis, and a large empty cyst, with secondary cysts in its walls, was found in the abdomen. A good-sized staff passed easily through the tube into the uterus.*

LITERATURE.

Richard: "Mémoires de la Société de Chirurgie de Paris," vol. iii. p. 121; 1853; Griffith: "Tubo-Ovarian Cysts"; Trans. Obstet. Soc. Lond., vol. xxix. p. 273.

* "Diseases of Women," p. 324; 1873.

CHAPTER XV.

SECONDARY CHANGES IN OVARIAN TUMOURS. INFLAMMATION AND ITS EFFECTS.

OVARIAN TUMOURS are liable to secondary changes, several of which are important clinically, as they endanger the life of the patient. The chief of these are :—

Inflammation and suppuration.
Axial rotation.
Rupture of the cyst.

Inflammation.—All who have performed, or assisted at, the operation of ovariotomy must have been struck by the fact that at times a large cyst holding ten or more litres of fluid will be withdrawn, its external surface being smooth and glistening like the healthy peritoneum, whilst in another and much smaller specimen the cyst wall is adherent to almost every organ in the neighbourhood, so that when its removal is at last accomplished the surface of the cyst is covered with villous tufts of new tissue, and resembles in outward appearance the shaggy sides of a Skye terrier. Such adhesions arise from the organisation of inflammatory exudation.

Ovarian tumours may inflame from several causes. At first glance it seems somewhat difficult to understand how ovarian cysts should become inflamed, enclosed as they are in air-tight cavities, and having no communication with other organs. A little reflection soon reveals several sources of infection. Of these the principal are :—

(1) The Fallopian tube.
(2) The intestine.
(3) The vermiform appendix.
(4) Tapping.

1. **The Fallopian Tube.**—The part played by this duct in producing inflammation of the ovary and pelvic peritoneum has been adequately recognised by many in recent years, but no writer has thought fit to discuss its relation to inflammation of ovarian tumours; yet every surgeon of experience will agree

in the opinion that of all adhesions encountered in ovariotomy, the densest and most difficult are those which occupy the pelvis.

Again, the opinion that the Fallopian tube is the channel by which the infecting material gains access to the walls of the tumour is not a matter of inference, but of direct observation, for an examination of such tumours will often reveal the fact that the adhesions are most abundant in the immediate neighbourhood of the ostium of the tube; and an examination of the tube will bring to light evidence of existing, recent, or past salpingitis.

Inflammation of the cyst wall, set up by infection conveyed through the Fallopian tube, is not always restricted to the immediate neighbourhood of the tubal ostium, but may extend over the cyst, and lead to adhesions between it and the omentum, intestines, and parietal peritoneum.

2. **The Intestine.**—A portion of the small intestine or the rectum may become adherent to the cyst wall in consequence of inflammatory changes arising in the gut itself. The adherent piece of intestine becomes pressed upon by the tumour, the wall of the gut thins and allows the intestinal gases to diffuse and cause suppuration. Occasionally the walls of the cyst become so thin that the gas enters the cavity of the cyst, sets up putrefaction, and converts it into a huge abscess; not rarely communication becomes established between the intestine and the interior of the cyst, whereby the contents of the cyst escape into the gut and are discharged at the anus. This condition is discussed in detail in chapter xvii.

3. **The Vermiform Appendix.**—More than one surgeon has noticed that the **vermiform appendix** has been fixed to the walls of a cyst by firm adhesions, but no one, so far as I know, has urged that in many of these **appendicitis** was the source of the inflammation which led to the adhesions.

It is important to recognise this relation of the appendix to ovarian tumours, because if it be cut through or torn, and the accident not recognised, disaster is sure to follow.

The frequency with which the vermiform appendix adheres to ovarian cysts is in part due to the fact that its mesentery is directly continuous with the right half of the mesometrium (broad ligament), and I have seen a large parovarian cyst, after

it has opened up the layers of the mesosalpinx, separate the layers of the mesentery of the vermiform appendix so that this structure has rested sessile on the cyst wall.

4. **Tapping.**—This simple but highly dangerous proceeding was in former days frequently resorted to by physicians, and often led to suppuration of the cyst. This was due in part to the use of dirty trocars and the admission of air with its usual complement of pathogenic micro-organisms. Tapping is now, happily for the patient, abandoned.

Suppuration.—The result of suppuration is to set up almost universal adhesions to surrounding structures; in acute cases severe symptoms arise, and unless the pus finds an exit, the patient dies. Even when the pus finds an outlet, the patient leads a miserable existence, becomes emaciated by the prolonged discharge, and dies worn out by suffering.

In **acute suppuration** of a large ovarian cyst the symptoms are very characteristic. The patient presents the usual signs of an ovarian tumour, with pain and tenderness on pressure; the pulse is rapid and feeble, and accompanied by great emaciation and exhaustion. The temperature is at first high, standing at 100° or 102° in the morning, and rising to 103° or 105° in the evening. As the patient becomes more and more exhausted towards the close of the case, the temperature may fall, and has been recorded as low as 95°. This low temperature has been observed in cases where the pus was unusually offensive. In many cases the urine contains albumen. The cyst sometimes contains gas: under such conditions the tumour dulness is replaced by a highly tympanitic note. It is a fact of some interest that suppurating ovarian cysts have given rise to signs simulating typhoid fever, and the patient has been treated for this disease until the accidental discovery of the tumour made the case clear. Suppuration of an ovarian cyst has followed an attack of typhoid fever, and typhoid bacilli have been found in the pus.

Suppurating dermoids of the ovary are by no means infrequent, and, like other forms of ovarian cysts, when inflamed they become firmly adherent to surrounding structures. They may burst into the belly, the rectum, bladder, vagina, or even through the abdominal wall, near Poupart's ligament, or at the umbilicus. Records of a large

number of cases of pelvic dermoids which have suppurated and discharged through mucous canals occur in medical and surgical literature. In some the fistula which forms gives rise to very little inconvenience, but when the cyst communicates with the bladder it may entail the greatest misery—fragments of bone, teeth, locks of hair, and sloughs become impacted in the urethra, and cystitis, with all its attendant evils, is the almost constant accompaniment.

Ovarian teeth retained in the bladder have formed the nuclei of phosphatic calculi.

Hair from ovarian dermoids entering the urinary bladder through a fistulous communication is voided with the urine, a condition described by French writers as **pilimiction.** The majority of cases reported as "dermoids of the bladder" were examples of ovarian dermoids communicating with this viscus.

Lücke,* in connection with pilimiction (Das Haarharnen), mentions the case of a devout (frommen) lady with long blond hair in whom lithotomy was necessary. A lock of blonde hair was extracted tied with blue silk ribbon.

An extensive study of the clinical reports of cases in which dermoids have suppurated and burst, either through the abdominal wall or into mucous canals, shows that the contents of the cysts have, in a few instances, sloughed out and the sinus closed, but in the majority life has been rendered a burden, death being induced by hectic, the duration of the case varying from a few months to several years. Occasionally the patients lead a tolerably comfortable existence, even in those cases where the cyst communicates with the bladder. Such patients are annoyed with the formation of concretions, which require removal from time to time, but eventually death is induced as a consequence of renal complications.†

Adhesions, from whatever cause arising, are a source of anxiety to the operator when they are abundant. A few straggling omental adhesions are of no moment, or a few fibrous bands connecting the cyst to the anterior abdominal wall; but when tracts of the small intestine, or colon, are firmly

* Pitha und Billroth, 1869.

† Herman's paper, "Suppurating Dermoid Cysts of the Pelvis," contains abstracts of many interesting cases (Trans. Obstet. Soc. Lond., vol. xxvii. p. 254).

united to the cyst wall by broad fibrous bands, or the tumour is fixed to the pelvic peritoneum by dense adhesions, the task of removing the tumour is very anxious, tedious, and occasionally impossible.

The mode by which adhesions arise is identical with the process by which bands form in connection with the intestines. The peritoneum becomes inflamed, and the exudation which accompanies that process—the so-called lymph—organises and undergoes slow conversion into fibrous tissue. When the

Fig. 72.—Portion of the Wall of an Ovarian Cyst, with shaggy Adhesions. (After *Doran*.)

parts united by this material remain in apposition during the process of organisation, a sessile adhesion is the result. If, whilst the lymph is recent or only partially organised, movement takes place between the parts, then the uniting material becomes stretched into broad or narrow bands, according to the amount of surface involved. Thus in some specimens the cyst when removed presents a shaggy appearance (Fig. 72); whilst in rarer cases the organised material will form a spurious capsule over a large portion of the cyst wall. Long adhesions are usually found over the anterior wall and crown of a cyst; sessile adhesions are most frequent on its pelvic aspect.

Old-standing adhesions usually contain blood-vessels, and these, when they spring from intestine or omentum or uterus, are of large size, and bleed freely when detached. So vascular are these adhesions that in some cases in which the pedicle of the tumour has been destroyed by rotation, or dragging, they have served to keep the tumour alive.

Adhesions to the pelvic peritoneum are most dreaded by surgeons, not only because of the difficulty in reaching them, but also on account of their relation to the iliac arteries and veins, the ovarian vessels and ureters at the brim of the pelvis. The iliac vessels have been laid bare in separating adhesions and lacerated; the inferior vena cava and the ureter have been torn through. In many cases the cyst wall has been found so intimately united to the peritoneum that a portion of it has been left behind.

CHAPTER XVI.

THE AXIAL ROTATION OF OVARIAN TUMOURS.

In 1860 Rokitansky drew attention to the fact that ovarian and uterine tumours sometimes rotate and twist their pedicles, or drag upon them in such a manner as to compress the vessels traversing the pedicles, and so interfere with the proper nutrition of the tumour. Occasionally the torsion, and, in some, the torsion and tension on the pedicle, led to complete detachment of the tumour. He also drew attention to the fact that certain abdominal viscera are apt to undergo axial rotation. Of recent years much attention has been devoted to this subject, and accumulated observations have served to show that almost every variety of abdominal tumour and all the viscera, except the liver, have been found liable to this accident.

That a tumour hanging freely in the belly should, by mere alteration of the position of the body, or by motion imparted to it by a tumult of the bowels, spin round and twist its pedicle is as comprehensible as the fact that a good weather-cock moves in varying directions under the influence of the wind. It is, however, puzzling to find the spleen, distended Fallopian tubes, undescended testes (Fig. 73), the pregnant uterus, the kidneys, the cæcum, and the stomach liable to similar rotation.

Ovarian tumours of all kinds are very liable to axial rotation. Concerning its cause, very little is known. Various explanations have been advanced. It has been attributed to the alternate distension and evacuation of the bladder (Klob), or to the passage of fæces through the rectum (Lawson Tait); to sudden movements, such as a fall, slip, or unusual exertion (Thornton). An important fact to remember is the frequency with which this accident occurs when ovarian cysts complicate pregnancy. (*See* the tables in chapter xxii.) In fifty-seven instances of axial rotation recorded by Thornton, fourteen were thus associated—that is, one-fourth of the total number.

Rotation is very apt to occur when an ovarian cyst complicates a uterine myoma, especially when the myoma fills the true pelvis.

When both ovaries are cystic, the risk of twisting is nearly the same as when pregnancy and an ovarian cyst are

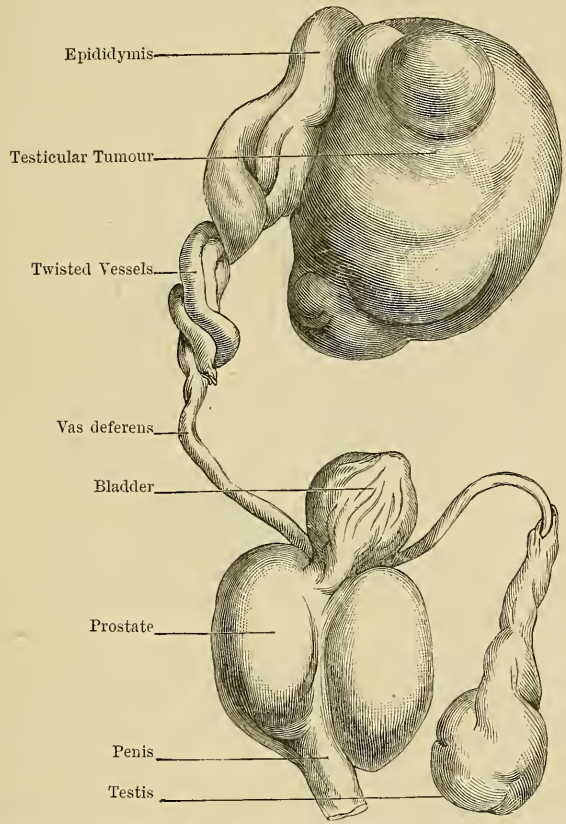

Fig. 73.—Tumour of an undescended Testis which had undergone Axial Rotation. From a pug dog.

associated; when both ovaries are cystic and pregnancy ensues, the risk of axial rotation is more than doubled.

The torsion may occur early in the pregnancy, or be delayed till delivery; in many of the cases it happened shortly after delivery or miscarriage.

The occurrence of acute torsion immediately after delivery

is doubtless due to the rapid diminution in size of the uterus, and the movement which this organ, as it sinks into the pelvis, imparts to the tumour.

A case of great importance in this relation has been recorded by Edwards:—*

A woman twenty-four years of age had, for at least two years previously, an ovarian tumour on the right side. The tumour did not attract much attention until she became pregnant in the early part of the year 1860. In October of

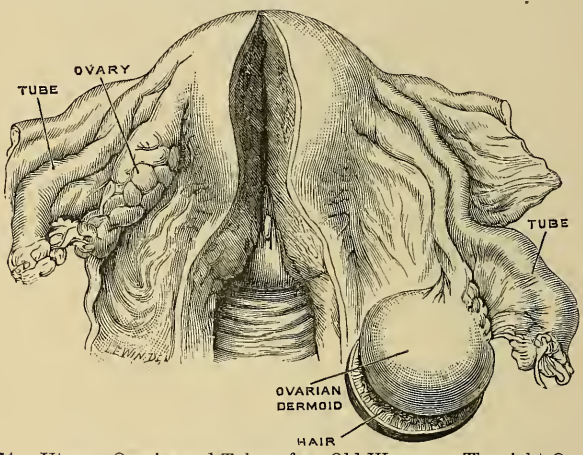

Fig. 74.—Uterus, Ovaries and Tubes of an Old Woman. The right Ovary is occupied by a Dermoid which has caused marked Elongation of the Tube and Ovarian Ligament.

that year she was delivered of a child which was scarcely full grown, and survived its birth a few days. "*Immediately after the birth of the child the tumour shifted over to the middle of the abdomen.*

On August 5th, 1861, this woman was again delivered of a child at the seventh month; it lived a few hours. After the birth of the child the tumour was found in the middle line of the abdomen. Two days later collapse occurred, and the patient died on August 8th.

At the *post-mortem* examination the pedicle of the cyst was found twisted one turn and a half; it contained four litres of blood-stained fluid. The ovary was found on the surface of the cyst, which was therefore of parovarian origin.

* *Lancet*, 1861, vol. ii. p. 336.

Rotation of a cyst in the early stages of pregnancy is probably due to the gradual enlargement of the uterus displacing the tumour upwards; and as the pressure is exerted upon one side of the cyst, it would be in a favourable position to impart a rotatory motion to a non-adherent cyst. The *amount* of rotation varies greatly. In some cases the cyst has only turned through half a circle; in others as many as twelve complete twists have been counted. The direction of the rotation may be from right to left, or *vice versâ*, but cysts exhibit a stronger tendency to rotate towards the middle line rather than from it. Tumours of the right and left side are equally liable to rotate.

Small tumours rotate more freely than large ones, and the specimen depicted in Fig. 74 may help to explain this. When a small but relatively heavy tumour forms in an ovary, it drags upon the ovarian ligament and Fallopian tube, and lengthens them. In the specimen referred to, the ovarian dermoid in size and shape resembled a Tangerine orange. The tension it exerted had so stretched the tissues of its pedicle that the tube measured 11 cm. and the ovarian ligament 6 cm.; whereas the opposite tube and ligament measure 8 cm. and 3 cm. respectively. This increased length of pedicle renders the tumour more mobile, and predisposes it to axial rotation.

The *effect* of torsion on the circulation depends on the tightness of the twist, and this varies with the thickness of the pedicle. The vessels in a long thin pedicle would suffer obstruction quicker than those in a short and thick one. When a pedicle is torsioned the thin-walled veins become compressed, whilst the more resilient arteries continue to convey blood to the cyst. The result is severe venous engorgement, and this leads to extravasation of blood into the cyst wall; in many cases the veins rupture, and hæmorrhage takes place into the cavity of the cyst. The hæmorrhage may be so profuse as to cause profound anæmia, and even death. Sir Spencer Wells* relates a case which occurred at the Hospital for Incurables, Putney. The patient had been found dead by the bedside. On opening the abdomen a large

* "Ovarian and Uterine Tumours," 1882, p. 64.

ovarian cyst was found, which contained 2 kilogrammes of blood-clot: the bleeding was secondary to a twisted pedicle.

When the venous circulation is completely arrested in consequence of torsion, the appearance of the cyst is very striking and characteristic. On opening the abdomen during life, instead of the cyst presenting the familiar white glistening appearance, it has a deep, dark, lustreless hue, which is most intense near its attachment to the pedicle. In milder degrees of torsion the change in colour only affects the base of the tumour. The pedicle on the distal side of the twist presents the same dark hue, but on the uterine side it is, as a rule, of natural tint. The contrast of colour in the two parts of the pedicle is very striking. The walls of the cyst are thick and succulent; the fluid contained in the cavity, or in the loculi if multilocular, may be of a chocolate or of a dark-red colour.

When such a cyst is removed from the body and the blood allowed to drain away, or is washed away by a gentle stream of water, the tissues will resume their natural colour. This should be remembered, because some writers have attributed this dark colour to gangrene of the cyst. This is erroneous; gangrene of an ovarian cyst is a rare event, and can only take place when air is admitted from without, as during the operation of tapping, or when intestinal fluids gain entrance.

The usual effects of acute torsion of the pedicle are passive congestion, thrombosis, and extravasation of blood into the tissues of the tumour and necrosis.

Necrosis is localised death, in contrast to death of the organism as a whole, or "somatic death."

Moist gangrene is necrosis followed by decomposition and putrefaction of the dead tissues. When soft parts necrose in situations where they are accessible to putrefactive organisms, such as the exterior of the body, the lungs, or the intestinal tract, decomposition rapidly ensues, especially if the parts contain much blood. In the case of ovarian tumours with twisted pedicles, not in communication with the outer air directly or indirectly, putrefactive organisms can rarely gain access to them to cause decomposition.

It is therefore erroneous to describe as gangrene the changes observed in cysts with torsioned pedicles. This is

further illustrated by the circumstance that small ovarian tumours may be completely twisted from their pedicles and subsequently shrink. Were the changes in the cyst gangrenous in character, general infection of the peritoneum and death would be the inevitable consequences.

Burdon Sanderson,* in his article on the Pathology of Inflammation, refers to the peculiar plan of emasculating animals known as **bistournage**. In this method, no instrument is used; the testicle is freed from its association with the dartos, then twisted on the spermatic cord as on an axis four or five times, the whole manipulation being performed with prodigious rapidity. If the animal is killed afterwards and the arteries injected, it is found that no blood enters the spermatic artery beyond the twisted part of the cord. Consequently, while the surrounding parts receive their natural supply of blood from the pudic artery and preserve their vitality, the testicle itself is irretrievably condemned to death. We have in the above method practically a crucial experiment, which demonstrates that when a testicle is deprived of blood in consequence of axial rotation it necroses and finally atrophies.

A perusal of the records of cases described as gangrenous cysts indicates that the reporters have regarded the deep livid hue of such cysts as evidence of gangrene, and others have confounded suppurating with gangrenous cysts.

Rotation of an ovarian cyst when it gives rise to such severe changes as have just been considered may be described as **acute torsion**. It frequently happens that during the performance of ovariotomy a thick pedicle is found twisted through half or even a complete circle, without producing an appreciable effect upon the tumour. In others, torsion takes place so gradually, yet so completely, that the pedicle is twisted like a rope, and not infrequently the pedicle breaks and the tumour becomes detached from its uterine connections. To this variety the term **slow** or **chronic torsion** may be applied. Its effects are not less interesting than those which follow acute twisting. When rotation occurs slowly the walls of the cyst inflame and adhesions are established between the cyst and the omentum, or the parietal

* Holmes and Hulke's "System of Surgery," vol. i. p. 84.

peritoneum; such adhesions become vascular, and maintain the vitality of the cyst wall after circulation is arrested through the pedicle. These adhesions prevent atrophy of the cyst, but are probably not sufficient to allow of it continuing to increase in size. Cysts have been observed in all stages

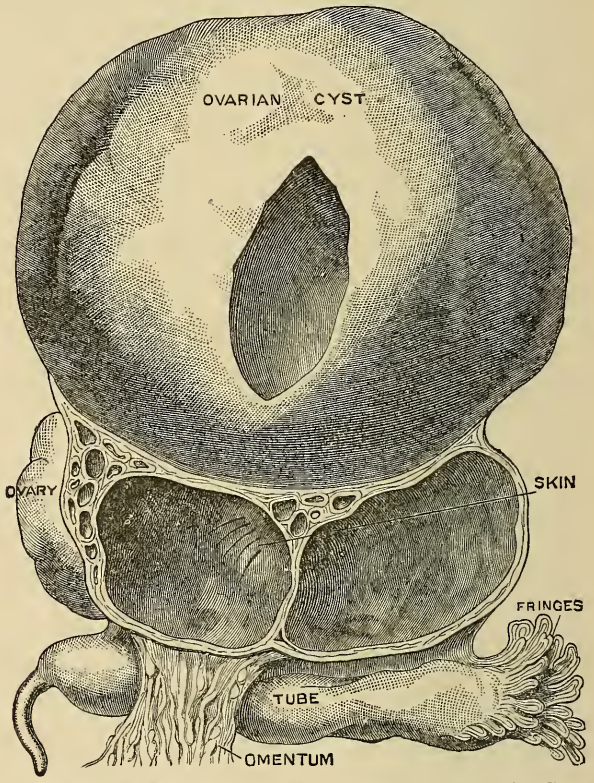

Fig. 75.—Ovarian Cyst which had become detached from its Uterine Connections, probably by Torsion.

of transplantation. The best example which I have had an opportunity of observing of this kind of adhesion was a cyst removed by Greig Smith; it was adherent to the omentum, but a thin frail band of tissue connected the tumour with the right angle of the uterus. The tumour was of the size of a melon and multilocular; one loculus contained a patch of piliferous skin. The thin frail ligament which indicated

the uterine attachment of the tumour was connected with the outer half of the Fallopian tube, which formed a conspicuous object on the cyst wall (Fig. 75).

It is a fact, not without interest, that *acute torsion* is

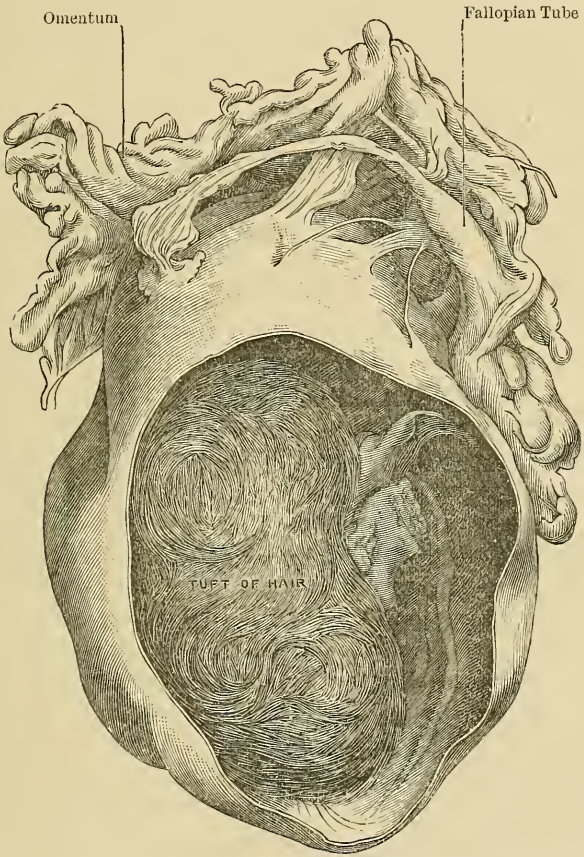

Fig. 76.—Ovarian Dermoid transplanted to the Omentum. (Removed by Sir G. Murray Humphry.)

more frequently seen in tumours of medium size. Acute torsion occurs in small cysts, but it is the small tumours, especially dermoids, in which *slow torsion* takes place. The tumours in which complete detachment takes place, accompanied by transplantation, are, in the majority of instances, dermoids (Fig. 76).

The symptoms of acute torsion of an ovarian cyst are

often so characteristic as to lead to a correct diagnosis. When a woman complains of sudden and violent pain in the abdomen, accompanied with vomiting, and she is known to have an ovarian tumour, or she presents herself for the first time to the surgeon, and these signs are associated with an abdominal swelling, the physical signs of which are indicative of an ovarian tumour, axial rotation should be suspected. Should the patient possess a gravid uterus as well as an ovarian cyst, it is even more probable that rotation has occurred; or if she have an ovarian tumour and has been recently delivered, this is an additional reason for suspecting that the symptoms arise from a twisted pedicle.

It is very important to be thoroughly alert to the possibility of this complication arising in a woman known to have an ovarian tumour, for in very acute torsion the patient's life depends on prompt action. This is admirably illustrated by the case reported by Dr. Wiltshire,* which has since become classical as the first instance in which ovariotomy was performed for acute symptoms caused by axial rotation. The patient was a woman fifty years of age, suffering from a very large ovarian cyst, which had been known to exist for some years. A few days before Dr. Wiltshire saw her she was seized, after some unusual exertion, with acute pain, tenderness, and swelling of the tumour, accompanied by incessant vomiting. The pulse was feeble (105), the extremities were cold, and the urine was small in amount. Stimulants were freely administered. Next day (May 4th, 1868), after successfully overcoming the prejudices of the practitioner in charge of the case and Dr. Murray, the abdomen was opened by Dr. Wiltshire. The tumour presented the appearance of a strangulated pile. There were no adhesions. When the cyst was punctured four litres of venous blood flowed through the cannula. The pedicle was tied in the usual way, but on cutting away the tumour the ligature slipped. The pedicle was so rotten that in order to arrest the hæmorrhage it was necessary to transfix "the right half of the body of the uterus," and tie it with a stout silk ligature. The patient made an admirable and uninterrupted recovery.

* Trans. Path. Soc., vol. xix. p. 295, 1868.

The case was a typical example of the effects of axial rotation, but the amount of twisting was not noted. "Mr. Spencer Wells suggested the source of the blood was the twisting of the cyst upon its pedicle;" and Dr. Wiltshire writes: "This explanation occurred to me at the time of the operation, for I noticed that the position of the tumour was altered after tapping." The case is of great interest, as marking a distinct advance in our method of dealing with this accident.

In many cases axial rotation can be and is correctly diagnosed; often the accident is suspected when in reality it is imitated by other conditions. This is more especially likely to happen when a gravid Fallopian tube ruptures. The two conditions often simulate each other. The differential diagnosis will be considered when dealing with tubal pregnancy.

Clinical observations demonstrate that the predominant signs of acute axial rotation of abdominal tumours and viscera are those common to a strangulated hernia minus stercoraceous vomiting.

Even the presence of fæcal vomiting does not always negative the existence of acute axial rotation of an ovarian tumour, for M. Ricard* described an instructive case in which acute symptoms of obstruction came on in a waitress at a restaurant, aged twenty-four. Intense pain in the right side of the abdomen set in when she was at work. She had to go home; furious vomiting occurred, and at the end of the second day it became fæcal. Three days later she was sent to hospital in a state of collapse, with all the symptoms of acute peritonitis. The abdomen was opened and an ovarian dermoid was found in the right iliac fossa, covered with adherent, inflamed, and distended intestines. These were detached, and then two pedicle-like structures were found. The inner and upper proved to be formed by 10 cm. of small intestine, perfectly empty and intimately adherent to the cyst, from whence it had to be carefully dissected. The lower was a true pedicle, twisted, thick, and fleshy. The tumour was removed. On the third day the bowels acted spontaneously. The pain and vomiting ceased immediately after the operation. Recovery

* *Gaz. des Hôpitaux*, January 1st, 1891.

was perfect. The close adhesion of the intestine to the cyst was evidently the cause of the obstruction. Before the attack of pain, which seized the patient quite suddenly, she had never been ill, never felt abdominal pain, nor noticed any tumour in the hypogastrium. The menstrual periods had been normal. Notwithstanding these negative symptoms, a small ovarian tumour existed, and caused acute obstruction.

Similar cases have been reported by Hilton Fagge * and Mundé.† Fagge's patient was admitted as a case of strangulated hernia.

Lawson Tait saw in consultation (1868) a woman forty-eight years of age with a small strangulated femoral hernia. This was relieved by herniotomy, and the acute symptoms subsided. Two days later the abdomen was tympanitic, temperature 101°, face dusky and anxious. Four days after the operation she died.

At the *post-mortem* examination a small ovarian cyst was found lying in the pelvis; it had rotated, and the pedicle had been tightly twisted through four and a half revolutions.

The *treatment* of a case of ovarian tumour in which twisting of the pedicle is suspected admits of no question—it is immediate ovariotomy; and some of the most brilliant results in abdominal surgery have been obtained in operations undertaken for this condition. The prognosis is very good, especially when adhesions are absent, or slight and few in number. The pedicle rarely causes trouble, as it is already narrowed by the rotation, and in many cases the vessels have become torsioned.

Axial rotation of other organs is considered in appropriate chapters, thus:—

Fallopian tube in chapter xxvi.
Hydrosalpinx, *ibid.*
The pregnant uterus in chapter xlii.
Myoma of the uterus in chapter xix.
The ovary in chapter iv.
The spleen in chapter xx.
Parovarian cysts in chapter xiii.

* Guy's Hospital Reports, vol. xiv. p. 357.

† *American Journal of Obstet.*, vol. xiii. p. 388.

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CHAPTER XVII.

PRESSURE EFFECTS.

THE pressure effects to be studied in connection with ovarian cysts are of two kinds:—The effects upon the cyst itself, and the mischief produced upon adjacent organs.

Leakage and Rupture of Cysts.—On examining a thin-walled ovarian, or parovarian cyst, many must have wondered, considering the great tension of the parts, how it continued to grow under such conditions, and with what slight force it could be ruptured. Indeed, so thin are the walls of these cysts in many places, manipulation during their removal often causes them to burst.

An examination of the walls of many ovarian cysts reveals the fact that they are not of uniform thickness; in some parts the thinner portions project as rounded prominences. These projecting and thin portions frequently correspond to secondary cysts or loculi. It is these thin cysts which so frequently rupture during the removal of a multilocular tumour. There is good evidence to lead us to believe that in the ordinary course of events such cysts occasionally burst into the cœlom and cause no harm.

Secondary cysts also burst into the main cavity of the tumour. Soon after bursting the margins of the aperture become thick and rounded; and as the cyst wall shrinks the recess resembles very closely the fossa ovalis, and its rounded edge the annulus ovalis, on the wall of the right auricular cavity of the heart. As the edge contracts the recess becomes obliterated, and its position is indicated by a thick radiating patch of cicatricial tissue. When small loculi—or secondary cysts, as they are frequently called—are situated near the periphery of a large cyst, they produce absorption as the result of continued pressure, and at last form prominences on its exterior. As a rule, only a few of these projections are present, but occasionally they are so numerous as to give the cyst an embossed appearance. It has already been mentioned that

cysts, originally multilocular, may become unilocular in consequence of the septa between the various cysts undergoing atrophy. An intermediate stage of this process is shown in Fig. 77. In this specimen two cysts of equal size have been growing side by side; persistent pressure has led to perforation of the septum, converting the dividing wall into a diaphragm with a central perforation. As the cyst grows the

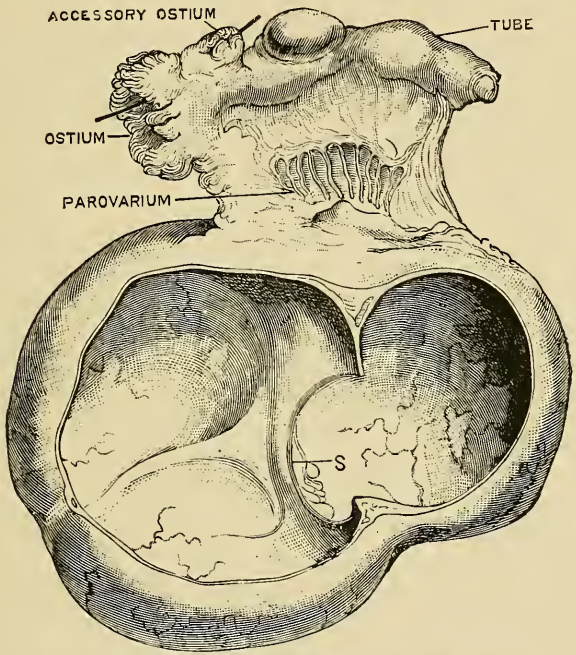

Fig. 77.—Bilocular Ovarian Cyst with a perforated Septum, s.

orifice increases in size, and the septum gradually atrophies, leaving, perhaps, a ridge on its inner wall.

The mode by which two cysts fuse together in one ovary illustrates the mode by which cysts originating in opposite ovaries fuse and communicate so as to form one cyst, or "fused double ovarian cysts," as they are called. Such conditions are, fortunately, not common, for they greatly embarrass the surgeon. The identification of the condition depends on the recognition of two true pedicles. One of the pedicles may be mistaken for a dense adhesion.

When the wall of a secondary cyst is very thin, or the parietes of a unilocular cyst become very attenuated, there is reason to believe that transudation takes place into the cœlom (peritoneal cavity), the fluid being slowly absorbed. This gradual leakage causes no ill effects to the patient, and the presence of even a large quantity of ovarian fluid is tolerated by the peritoneum. An interesting and striking instance of this has been recorded by W. A. Meredith *:—

A single woman, forty-seven years of age, had suffered from abdominal enlargement ten years. She came under observation August, 1871. An ovarian tumour was diagnosed and tapped, eleven litres of fluid being withdrawn. The cyst refilled in four months. "After suffering a smart attack of pain near the seat of the tapping puncture, she noticed one day a sudden alteration in the shape of the tumour, and within twenty-four hours began passing large quantities of clear urine. This state of diuresis persisted for four or five days, at the end of which time all traces of the abdominal swelling had disappeared." This refilling of the cyst, followed by spontaneous rupture and removal of the extravasated fluid by diuresis, recurred with remarkable regularity three or four times in the course of each year. On one occasion she was tapped by a country doctor, who drew off a "pailful of clear fluid."

In September, 1879, when she presented herself at the Samaritan Hospital, no abdominal tumour could be detected; she returned in two months, and "the abdomen was found uniformly distended by a tense, distinctly fluctuating tumour."

This cyst, which had ruptured thirty-four times during a period of nine years, was removed December 4th, 1879. The only adhesions present were a few filamentous bands about the site of the tapping puncture. The cyst contained twelve litres of fluid. It had one large cavity, with a group of secondary cysts growing on its inner wall; "the remains of the ovary, together with the adherent Fallopian tube, are seen on its outer surface." This is sufficient to show that it was a parovarian cyst. Numerous recesses and cicatrices were detected on the inner wall of the cyst.

It is remarkable that during all the years the patient

* Trans. Path. Soc., vol. xxxi. p. 180.

had this tumour "she was never once incapacitated for a single day for the performance of her ordinary duties as a housemaid."

The history of this extraordinary case illustrates admirably the clinical signs of so-called spontaneous rupture of a large unilocular cyst:—

(1) Sudden accession of pain, accompanied by alteration in the shape of the tumour.

(2) Subsequent profuse diuresis.

(3) Gradual re-accumulation of the fluid in the cyst.

This case demonstrates the rapidity with which large quantities of fluid collect in ovarian and parovarian cysts after rupture. The following account of a large dried ovarian cyst preserved in the museum of the Royal College of Surgeons is also significant in this respect:—

The patient was twenty-seven years old when the disease commenced, after a miscarriage of her first child. Between the year 1757 and August, 1783, when she died, she underwent the operation of tapping eighty times; and in these operations there were altogether removed from her 6,631 pints of fluid, or upwards of thirteen hogsheads. One hundred and eight pints was the largest quantity ever taken away at one time; she was never tapped more than five times in one year, and the largest quantity in a year was 495 pints. The most fluid collected in the shortest space of time was ninety pints in seven weeks, from July 24th to September 10th, 1780, which is very nearly two pints a day. "On the 10th of August, 1783, the poor woman died. On the following day, on opening the body, seventy-eight pints of clear fluid were drawn off. Supposing, therefore, all the fluid to have been taken off at the last operation, then in three weeks she had collected seventy-eight pints, which is more than three pints and a half each day—a quantity far exceeding what she had taken." The disease was situated in the left ovarium. The sac is in the collection of John Hunter, Esq.

The history of the case is recorded by Mr. P. M. Martineau, surgeon to the Norfolk and Norwich Hospital, in the Philosophical Transactions for 1784, vol. lxxiv. p. 471.

Tombstones have been used to record less remarkable

cases. Thus Mead* gives the particulars of a patient who was frequently tapped, and the "good lady, for the information of posterity, ordered by her will that an inscription should be engraved on her monument to signify that the tomb contained the body of Dame Mary Page, that she died in her fifty-sixth year. In sixty-seven months she was tapped sixty-six times, and had taken away 240 gallons of water, without ever repining at her case or fearing the operation. The tomb is in Bunhill Fields burial-ground (date 1728)." Peaslee† has collected some extraordinary cases of this kind from American literature.

It may be questioned whether these were really cases of ovarian cysts, for they lack the proof of Martineau's case mentioned above, namely, actual preservation of the cyst. Some of them may have been examples of hydroperitoneum, and this seems extremely probable in the light afforded by Dr. Pye-Smith's extraordinary patient who was tapped 299 times. (*See* page 89.)

The rupture of an ovarian cyst is sometimes attended with hæmorrhage, or, what is more probable, the escape of fluid may relieve the tension, and free bleeding takes place into the cavity of the cyst. Rapidly fatal hæmorrhage from rupture of an ovarian cyst is usually associated with axial rotation of the tumour: an accident which was fully considered in the preceding chapter. When a multilocular cyst bursts, the fluid which escapes is rarely great, for as it flows through the rent it often carries before it a secondary cyst, which quickly plugs the opening.

When the fluid is mucoid or colloid in character, it is not tolerated so easily by the peritoneum; the omentum becomes thickened and dotted with small opaque bodies, and the peritoneum is injected and roughened, sometimes giving rise to a kind of faint crepitus when palpated.

Olshausen‡ refers to this peculiar crepitation as **colloid-knittern**, but says it may be perceived in relation with unruptured cysts.

* "Medical Works," 1765, vol. iii. p. 81; also Tait, *Ed. Med. Journal*, July, 1889, p. 7.

† "Ovarian Tumours," p. 40.

‡ "Krankheiten der Ovarien," s. 119.

When cysts containing papillomatous masses burst, portions detached from the warts are scattered far and wide through the cœlom, and become engrafted on the peritoneum. The effect of this in relation to papillomatous cysts has already been considered in chapter xii.

When describing the distribution of the pelvic peritoneum mention was made of a case in which a secondary process of this membrane descended towards the perineum, behind the vagina. Matthews Duncan,* in some interesting "Notes on the Morbid Anatomy of Douglas's Pouch," refers to the case of a woman, a patient in the Royal Infirmary, Edinburgh, who had a large ovarian cyst which burst and discharged so copious an amount of very viscid clear jelly as to distend her abdomen extremely; it was too viscid to flow through a trocar. In the latter weeks of the woman's life a rounded firm tumour protruded from the vagina.

At the *post-mortem* examination it was found to be a hernial protrusion of the peritoneum of Douglas's pouch. At the bottom of the fossa was an opening admitting two fingers, which established communication with the hernial sac, descending between the rectum and vagina, and then protruding the latter. The sac was larger than a hen's egg. It was full of very viscid gelatinous ovarian fluid, which adhered to its peritoneal surface.

It is extraordinary what a large amount of free colloid material the belly will hold without the patient evincing discomfort. I have already referred to a woman from whose cœlom I removed on two occasions 4 litres of this stuff, equal in consistence to calf's-foot jelly (page 83).

Rupture of Ovarian Cysts into Hollow Viscera.—It has already been shown that ovarian cysts, especially dermoids, are prone to inflame and contract adhesions to the adjacent portions of the alimentary canal, especially the rectum. Such adhesions produce intimate union of the parts, and subsequent oozing of intestinal contents leads to suppuration of the cyst, the pus finding an escape through the rectum by means of a fistula which forms between it and the cyst.

Communication may take place between the cyst and an adjacent loop of gut in the same method by which adjacent

* St. Bartholomew's Hospital Reports, vol. xvii. p. 1.

cysts communicate: the continuous pressure that they exert upon each other produces absorption of the tissues forming their walls.

When communication between an ovarian cyst and the rectum or colon becomes established, it produces marked alteration in the physical signs. I once saw a woman forty years of age with a tumour as large as her head projecting in the hypogastrium, so tense as to simulate a uterine myoma. The next morning she had a sudden pain in the belly, followed by a free discharge of pus from the anus. The previously dull mass in the hypogastrium furnished to percussion a note as resonant as that elicited over a pneumothorax. She died in a few days. An ovarian cyst was found communicating with the sigmoid flexure of the colon by a circular orifice 2 cm. in diameter.

Rupture from Violence.—Ovarian cysts have been accidentally ruptured in a variety of ways—*e.g.* during an *immoderate fit of laughter*, in stooping to *button the boots*, or even during the *manipulation* of the physician. Among other causes may be mentioned *vomiting* and *coughing*, but by far the most frequent cause is a *fall*.

Barnes* briefly records the case of a woman with an ovarian tumour who was descending in the lift at the old St. Thomas's Hospital. The machinery gave way, and the lift came down with a run. The concussion burst the cyst. Copious diuresis followed. The woman recovered.

Wiltshire† has recorded an instance in which a lady with an ovarian cyst stood up in a hansom cab to speak to the driver through the trap in the roof. The horse fell, and she was thrown forward on the sharp angle of the corner of the door and burst the cyst. The patient recovered.

I have thrice witnessed the rupture of an ovarian cyst during consultation. The physical examination of a patient's belly when a cyst is present should be conducted with the same gentleness when she is unconscious as when awake.

When the tumour is very large, and extends upwards beyond the umbilicus, it leads to displacement and distortion of the abdominal organs, and the diaphragm is pushed

* "Diseases of Women," p. 339, 1873.

† Trans. Clin. Soc. Lond., vol. xv. p. 1.

upwards and encroaches upon the cavity of the thorax. When the cyst is very large, the lower ribs may be turned outwards, the intercostal spaces widened; and the lower portions of the lungs become atelectic from pressure. Such conditions seriously impair respiration, and lead to pleural effusion, dyspnœa, and death. Fortunately, at the present day such conditions are rarely witnessed, as the patients, inspired by the great success that now attends abdominal surgery, usually seek relief before the tumours attain such large dimensions.

The tumour may press upon the veins at the brim of the pelvis and give rise to œdema of the lower limbs, or if the inferior vena cava is pressed upon, fluid will accumulate in the belly.

Occasionally, a tumour impacted in the pelvis will press upon the rectum and cause obstruction to the passage of fæces; or press upon the bladder and give rise to frequent or painful micturition.

Effects on the Urinary Organs.—The renal changes that complicate ovarian tumours form two distinct groups:—

(1) Changes due to mechanical interference with the escape of urine—hydronephrosis.

(2) Septic changes originating in the bladder.

1. **Hydronephrosis.**—When the free flow of urine down the ureter is interfered with, in consequence of the compression of this duct by a tumour, the retained fluid causes at first distension of the ureter and the renal pelvis. If the obstruction continue, it will lead to sacculation of the kidney, and finally absorption of the secreting tissue of this organ, which at length becomes converted into a retention cyst—a condition of the kidney conveniently termed hydronephrosis. There are few facts at our disposal relative to the frequency with which hydronephrotic distension of the kidney complicates ovarian cysts, because the condition when caused by these tumours is, as a rule, unilateral and, unless very large, rarely attracts attention.

Hydronephrosis, secondary to the pressure of an ovarian cyst on one or both of the ureters, has been several times recorded in which the dilated kidney was large enough to become conspicuous clinically.*

* Knowsley Thornton, *Med. Times and Gazette*, 1883, vol. i. p. 624. Treves, *Lancet*, Sept. 24th, 1887.

My observations teach me that hydronephrosis more frequently complicates an ovarian cyst of small size impacted in the pelvis than a large cyst rising high in the belly.

Alteration in the Quantity of the Urine.—There is a form of renal disturbance caused by large ovarian and parovarian cysts to which Sir Spencer Wells has directed attention, and which is obviously the result of the pressure exercised by the tumour. This disturbance is indicated by the voiding of "only a small quantity of highly concentrated urine, depositing mixed urates in abundance."

One of the most striking examples of this kind of renal disturbance which has come under my own notice occurred in a woman sixty-nine years of age. She had an ovarian adenoma (30 kilos.), and for five days preceding ovariotomy the amount of urine excreted daily was under half a litre. It was free from albumen, but contained large quantities of pink lithates. During the two days following the operation the amount of urine voided did not increase, but on the third day it measured 1 litre, on the fourth day 2 litres. For the rest of the time the woman remained under observation the output of urine varied from 1·5 to 2 litres. Four years later she was in excellent health.

The precise cause of the diminution in the quantity of urine secreted under such conditions is not very clear.

2. **Septic Complications of Bladder and Kidney.**—We must now consider the more serious condition when inflammatory changes in the bladder and kidney are associated with the presence of an ovarian cyst.

Cystitis may occur in a patient with an ovarian tumour as a consequence, or independently, of its presence. Under any condition it is a serious complication. It is not the cystitis that the surgeon fears so much as the morbid changes it induces in the kidneys. When fermentation of urine occurs in the bladder, the agents by which this change is induced pass by way of the ureters to the renal pelvis, and the inflammation thus excited extends thence into the substance of the kidneys, giving rise to infective nephritis and pyonephrosis—conditions which surgeons too well know always increase the risks of surgical operations of all kinds.

The dangers of such conditions to patients who are

submitted to ovariotomy is shown by Doran's statement, "that in thirty-two out of over forty necropsies I have made on the bodies of patients who have died either after ovariotomy or with large ovarian tumours in the abdomen, I have found that the kidneys presented very distinct morbid appearances. The clinical evidence was strong that in the majority of these cases the disease was due to the presence of a tumour."

Intestinal Obstruction.—It is rare that the pressure of an ovarian tumour leads to intestinal obstruction even when impacted in the pelvis; it may hinder the passage of fæces and cause constipation. Acute intestinal obstruction depending on an ovarian tumour is usually induced by a portion of small bowel becoming involved in a twisted pedicle, as in the cases reported on page 127.

CHAPTER XVIII.

THE DIAGNOSIS OF OVARIAN TUMOURS.

The diagnosis of ovarian tumours involves the question of the diagnosis of abdominal swellings in general. Indeed, there is no organ in the belly, except the suprarenal capsule, which has not at some time or other given rise to signs resembling those presented by an ovarian cyst. These facts alone will serve to show that there is no pathognomonic sign indicative of an ovarian tumour. In many cases the methods of physical examination are insufficient to enable us to form a correct opinion of the nature of an abdominal tumour until it has been actually exposed to view; even with the abdomen open doubts and difficulties sometimes arise. The subject will be discussed in this work in the following sections:—

(1) Tumours which occupy the pelvis and abdomen.

(2) Tubal gestation.

(3) Tumours restricted to the pelvis.

This and the two succeeding chapters will be confined to the diagnosis of ovarian tumours large enough to rise out of the pelvis and occupy the abdomen, and their differentiation from morbid conditions of the belly which so often simulate them.

Method of Examination.—When a patient suspected to have an ovarian tumour comes under observation, it is the duty of the surgeon or physician, as the case may be, to inquire into the *history* of the case: information concerning the age, social condition, and menstrual history is often as important in diagnosis as a knowledge of the general physical condition of the patient and the facts she may be able to relate concerning the tumour itself.

In conducting the physical examination of the patient, she should, whenever possible, be undressed, for nothing is so unsatisfactory as examining an abdomen to ascertain the existence, or nature, of a tumour when the parts are

encumbered by partially loosened skirts, petticoats, stays, and other garments.

The patient should be placed, when undressed, with her back flat upon a bed or couch, and the legs covered with a sheet or blanket, and the surgeon should be careful that his hands and finger-tips are not cold, as this is most uncomfortable to the patient, and hinders a proper examination.

In a typical case of ovarian tumour the size of the abdomen is increased. With a big cyst the enlargement is general; but localised, when the tumour is of moderate dimensions, to one or other flank. Local enlargements due to ovarian tumours are always most marked below the level of the umbilicus. The skin of the abdomen sometimes presents a brown discoloration, and the superficial veins may be distended.

On **palpation,** the swelling feels firm and resisting. In cystic tumours its surface is uniform, as a rule, but multilocular cysts may have an irregular surface: this is also true of ovarian adenomata. Manipulation rarely causes pain. In large cysts a wave of fluctuation can easily be produced; in multilocular cysts this sign is restricted to the large cavities. The distinctness with which the wave is perceived depends upon the character of the fluid and the thickness of the abdominal wall.

Percussion furnishes valuable evidence. The crown and sides of the swelling are quite dull, but on approaching the loins the dulness gradually gives way to resonance. If now the patient be turned to one or other side we shall find that the alteration in position does not affect the percussion note. In those exceptional cases where the cyst communicates with intestine, the swelling yields a tympanitic note on percussion, due to the presence of intestinal gas.

Auscultation, as a rule, gives no information. Gurgling of intestines and, occasionally, the pulsation of the aorta may be perceived, and very rarely a bruit has been detected. In non-ovarian tumours this method of physical examination often affords valuable information. After examining the abdomen, the surgeon should explore the parts by an *internal examination.* As a rule, this is best made through the vagina, but in young unmarried girls it will sometimes

be necessary to make the examination by the rectum. In this way the surgeon ascertains the relation of the tumour to the uterus, the condition of this organ, and the state of the rectum. In uncomplicated cases of ovarian tumour the information furnished by a vaginal or rectal examination is negative, but it should always be undertaken, as it is not infrequently of the greatest value in enabling the surgeon to detect complications previously unsuspected.

Lastly, the **urine** should be examined. This, for some curious reason, is strangely neglected by surgeons, yet it often furnishes very significant information.

The recognition of a large uncomplicated ovarian or parovarian cyst is one of the simplest processes in clinical surgery. The signs may be thus summarised:—A swelling of the abdomen most marked below the umbilicus, associated with absolute dulness to percussion all over the tumour, most marked on its summit, and tailing away to resonance in the flanks; such dulness not being affected by alteration in the position of the patient. If these signs be associated with a uterus of normal size, the presumption that the swelling is an ovarian tumour is more certain than most things in clinical medicine.

The diagnosis of simple cases of ovarian tumour rarely gives rise to difficulty if the surgeon duly weighs the various signs together and does not place too much reliance on any one of them. Difficulty arises sometimes in distinguishing between ovarian tumours and conditions which simulate them; the greatest care and skill are needed when diagnosis is complicated by secondary changes in the cyst, and by the co-existence of other tumours, abnormal conditions of the abdominal viscera, hydroperitoneum, or pregnancy.

Some of the more important conditions which simulate ovarian tumours will now be considered, and in order to facilitate the study of this important matter the accompanying table has been drawn up and references added, so that the student may turn without difficulty to that part of the book where he will find the particular subject discussed. It must also be borne in mind that the undermentioned conditions not only simulate ovarian tumours, but ovarian tumours may be, and very often are, confounded with them.

CONDITIONS SIMULATING OVARIAN TUMOURS.

1. **Obesity**, page 144.
2. **Phantom Tumour**, page 144.
3. **Ascites** and **Hydroperitoneum**, page 145.
4. **Distended Bladder and Allantoic Cysts**, page 148.

5. **Uterus**, page 149.	Normal pregnancy.	Myoma.
	Hydramnios.	Hydrometra.
	Hydatid moles.	Pyometra.
	Retroversion of gravid uterus.	Hæmatometra.
6. **Fallopian Tubes.**	Pregnancy, page 301.	Hydrosalpinx, page 216.
	Pyosalpinx, page 212	Adenoma, page 224.
7. **Mesometrium**, page 334 (Broad ligament).	Cellulitis.	Lipoma.
	Abscess.	Tubal pregnancy.
	Sarcoma.	
	Myoma.	
8. **Omentum**, page 169.		Lipoma.
	Hydrocele.	Colloid disease.
9. **Mesentery**, page 169.	Lipoma.	
	Chyle cysts.	
10. **Kidney**, page 160.	Hydronephrosis.	Single kidney.
	Cystic kidney.	
	Pyonephrosis.	
	Sarcoma.	
	Movable kidney.	
11. **Spleen**, page 164.	Leucocythæmic spleen.	Wandering spleen.
	Hypertrophic spleen.	
	Misplaced spleen.	Cystic spleen.
12. **Liver**, page 166.	Fatty.	Distended gall-bladder.
	Cancerous.	

13. **Dilated Stomach**, page 168.
14. **Fæcal Accumulation**, page 170.
15. **Pancreatic Cysts**, page 170.
16. **Post-rectal Dermoid**, page 171.
17. **Echinococcus Cysts** (Hydatids).

Kidney, page 164.
Liver, page 166.
Mesometrium, page 354.
Omentum, page 169.
Spleen, page 166.
Uterus, page 352.

It is necessary to determine in the first place that the patient has a tumour in her belly. There are two sources of error in this direction: obesity and the curious condition known as phantom tumour.

Obesity.—It would seem unnecessary to mention that undue fatness could be mistaken for an ovarian tumour, but it is a fact that such errors in diagnosis have been committed, apart from Lizar's * celebrated case, in which, after opening a woman's belly to remove a supposed ovarian tumour, he writes:—"I now proceeded to examine the state of the tumour, when, to my astonishment, I could find none." In continuing the description of the case, he explains:—"The reason why all of us were deceived in this woman's case was the great obesity and distended fulness of the intestines."

This happened in 1824, and, even with the accumulated experience of seventy years to guide them, errors of this kind are even now occasionally committed by surgeons.

Phantom Tumour (Pseudocyesis).—This very curious form of mimicry, sometimes called "spurious pregnancy," simulates ovarian and other abdominal swellings as well as pregnancy.

The symptoms of phantom tumour are briefly these: a woman will fancy she is pregnant or suffering from a tumour, and states that her abdomen has been gradually increasing in size.

These cases rarely give rise to difficulty. When the abdomen is submitted to physical examination, it will be found everywhere resonant, and loud intestinal gurgling is usually present; by cautiously engaging the patient in conversation during the manipulation, the belly may be pressed quite flat. In such a case the age gives important indications, especially when the woman is long past the menopause. Again, in younger women, the other signs of pregnancy, such as enlargement of the breasts, morning sickness, increase in the size of the uterus, and amenorrhœa, are usually wanting.

If after a physical examination the surgeon still feels in doubt, an anæsthetic will decide the question: as the patient becomes unconscious the abdomen diminishes in size until it becomes quite flat; as the patient returns to consciousness the abdominal distension reappears.

Phantom tumour occurs more especially in sterile women who have married late in life and in women who have a morbid

* *Ed. Med. and Surg. Journal*, vol. xxii. p. 253.

desire for pregnancy. It is occasionally met with in women who have borne children, and now and then in young wives. Sometimes it is seen in women who have subjected themselves to illicit intercourse and fear the results.

Smollett * furnishes an admirable description of spurious pregnancy occurring in an elderly woman in his account of the supposed pregnancy of Mrs. Trunnion.

A remarkable case is recorded by Havelock.† The patient was seduced, and, becoming alarmed at the possibility of pregnancy, fell into a state of religious ecstasy. The rest of the family, consisting of four adolescent sons and four daughters and the parents, fell into an ecstatic condition and remained so many days. Eventually they came to their senses, but the girl was retained in the asylum. She had many signs of pregnancy: amenorrhœa for several months, milky fluid could be expressed from the breast, and the areolæ were altered. Gradually the mental condition improved and the signs of pregnancy disappeared.

As to the cause of the singular mimicry no good explanation is forthcoming; conditions resembling it have been reported in the ass, and are not uncommon in petted bitches.

It is difficult to understand how this condition could be mistaken for an abdominal tumour, yet more than one case has been recorded in which the abdomen was opened to remove the supposed tumour. Most of the cases occurred in the early days of ovariotomy, and now that surgeons are fully aware of the condition, and with the assistance afforded by an anæsthetic, such blunders are not likely to be made.

A patient in middle or advanced life sometimes imagines she has dropsy or a tumour because the abdomen has increased in size; on examination the enlargement will often be found to be due to an accumulation of subcutaneous fat and tympanites.

Ascites and Hydroperitoneum.—Fluid accumulations in the belly are, as a rule, readily distinguished from ovarian cysts, but many instances are known in which ascites has been mistaken for an ovarian cyst, and *vice versâ*.

* "Peregrine Pickle," chap. x.

† Obstet. Trans. Edin., vol. xix. p. 183.

Under the general term "ascites" it is usual to include all serous effusions into the cœlom occurring from obstruction to the portal circulation, renal or cardiac disease.

In well-marked ascites there is rarely any difficulty in diagnosis; the abdomen is uniformly enlarged; when the patient lies on her back the fluid occupies the flanks, and when abundant the sides of the belly form a convex curve from the lower ribs to the crest of each ilium. On percussion the flanks and lower half of the abdomen are dull, whilst around the umbilicus a clear resonant note is obtained. If the patient be now turned to one or other side, the conditions are reversed; the higher flank becomes resonant and the umbilical region dull. This shifting dulness is the most characteristic sign of ascites. In addition, when the fluid is present in sufficient quantity, a percussion wave may be easily produced from side to side.

The condition most likely to be mistaken for ascites is a *large unilocular cyst.* The form of ascites which most simulates an ovarian cyst is a rare variety, termed *encysted dropsy.*

Large passive effusions of fluid in the belly, secondary to hepatic, renal, or cardiac disease, are very rarely a source of difficulty; the history of the case, the general aspect of the patient, and the physical signs connected with the circulation, such as œdema of the limbs, cardiac murmurs, distended superficial veins, and the like, all serve to put us on our guard.

In cases of **tubercular peritonitis** the intestines are so matted together and thickened that they may occasionally furnish a dull percussion note in the middle of the abdomen, especially when the omentum forms a broad thick band on the surface of the fluid near the umbilicus.

Hydroperitoneum due to *secondary cancer* of the peritoneum, malignant tumours of the ovary, papillomatous cysts and salpingitis, is often associated with grave constitutional disturbance (such as emaciation, sometimes pain and the appearance which is termed cachexia), that usually indicates to the shrewd practitioner the character of the disease.

Many attempts have been made to detect among the *fluids* found in ovarian cysts characters (chemical, microscopic,

or spectroscopic) which would serve to distinguish them from passive or inflammatory effusions into the cœlom. Not only have the attempts failed in this respect, but they have not even succeeded in detecting any sign by which it could be definitely decided that a given sample of fluid indicated malignant disease of the ovary or peritoneum.

In cases where it is impossible to come to a positive diagnosis between the two conditions, and the patient is so greatly distressed by the accumulation that it is necessary to relieve her by removing the fluid, or cyst, as the case may be, instead of adopting the unsatisfactory method of puncturing the abdomen with a trocar, I make a small incision in the linea alba capable of admitting an index finger. In this way, information is obtainable in a manner impossible by other means. If a removable tumour be present, the incision is at once enlarged and the operation completed. Should the fluid be free in the belly it can be evacuated through the incision quickly and more completely than through a cannula, and without any fear of wounding a piece of bowel that may chance to be floating on the fluid; and, if necessary, the cavity may be washed or sponged out.

Hydroperitoneum is an almost constant accompaniment of *ovarian sarcomata;* it must not, however, be inferred that when free fluid co-exists with an ovarian tumour that it necessarily indicates *malignancy.* It is, of course, a very suspicious sign, but many instances have been observed in which such fears have, fortunately, not been realised.

Hydroperitoneum complicates many pelvic conditions. The reader should refer to the following sections of this book for information under the headings named:

1. Ovarian dermoids, page 77.
2. Papillomatous cysts of the ovary, page 89.
3. Salpingitis, page 339.
4. Fallopian adenomata, page 227.

Ovarian Sarcomata are accompanied by other signs as well as ascites which will often lead to a correct diagnosis. For instance, *menstruation* is, as a rule, irregular; in some it is suppressed, in others increased in quantity; it may even be diminished at one period and increased at another. In

simple ovarian tumours the menstruation is usually unaffected. *Emaciation* is the rule. *Age* lends no assistance, as malignant ovarian tumours have been reported as early as the third year. The *physical signs* of solid ovarian tumours resemble rather those presented by uterine myomata than ovarian cysts; in a fair proportion of cases both ovaries are affected. It should be borne in mind that secondary cancer attacks the ovaries, especially when the primary tumour is in the breast. I have seen well-advanced mammary cancer co-exist with an ovarian cyst. It caused some difficulty in diagnosis, as it gave rise to the suspicion that the abdominal swelling might be hydroperitoneum due to secondary deposits in the viscera.

The Bladder.—A distended bladder has been mistaken for an ovarian cyst and even tapped. It is difficult to understand how such an error arose. The peculiar pyriform outline of the swelling formed by an over-full bladder, sometimes extending as high as the umbilicus, is very characteristic. Extreme distension of the bladder is of frequent occurrence in uterine tumours, especially myoma, in pelvic tumours, and in retroversion of the gravid uterus. Under the last-mentioned condition the bladder has been reported to have held 5 litres of urine.

Allantoic Cysts.—The urachus is the normally impervious cord passing from the bladder to the umbilicus; like the bladder, it represents a persistent portion of the allantois. The urachus is liable to several interesting abnormalities. Instead of becoming an impervious cord, it may dilate and form a cyst as large as the bladder. Sometimes the cyst communicates with the bladder, the epithelium of the two cavities being directly continuous.

Allantoic cysts, like over-distended bladders, are situated between the peritoneum and the anterior abdominal wall.

CHAPTER XIX.

THE DIFFERENTIAL DIAGNOSIS OF OVARIAN TUMOURS. UTERINE ENLARGEMENTS.

It is of the utmost importance to distinguish clearly between an enlargement of the uterus and an ovarian tumour. It is also necessary to bear in mind that the two conditions may be associated. The chief enlargements are the following:—

a. Normal pregnancy.
b. Hydramnios.
c. "Hydatid" moles.
d. Retroversion of the gravid uterus.
e. Uterine myomata.
f. Retention cysts { Hydrometra. Pyometra. Hæmatometra. Hæmatokolpos.

(*a*) **Normal Pregnancy.**—Montgomery, in the preface to his classical "Exposition of the Signs of Pregnancy" (1837), in reference to the occasional difficulties which beset the recognition of pregnancy, writes: "I apprehend few will be found to dissent from the opinion of Van Swieten, that there is no circumstance where a physician's reputation runs so great a risk as when he is employed to determine concerning pregnancy; if he is not exceedingly cautious, there are, everywhere, a number of frauds, a number of insidious, cunning tricks, by which he may be easily imposed upon." This opinion has been reiterated by subsequent writers on pregnancy. A gravid uterus rarely complicates the diagnosis of ovarian tumour until the fifth month; in the case of married women at the child-bearing period of life, under usual circumstances, there is little danger of mistaking a pregnant uterus for an ovarian tumour; the risk of error is in the opposite direction, and it is not uncommon for a married woman with a rapidly-growing ovarian cyst to imagine herself

pregnant in consequence of the increasing enlargement of her belly, arrange for the advent of the baby, and even have the nurse ready to receive it (page 82).

In an ordinary case of uterine pregnancy in a married or in a single woman, after the fifth month the signs are so complete as to make the diagnosis simple:— 1. Amenorrhœa. 2. Fulness of the breasts. 3. In first pregnancy, the pigmentation of the mammary areolæ and prominent tubercles. 4. The presence of a tumour in the hypogastrium which hardens and softens under firm continued pressure of the palm. 5. The movements, or the outlines of the fœtus may be felt. 6. Softness of the cervix. 7. Ballottement. 8. The fœtal heart and the placental bruit.

The cases which give rise to difficulty are those in which individuals have motives for concealing their pregnancy, or cases in which there is some abnormal condition of the fœtus or its membrane, or tumours in addition to pregnancy. It is also important to remember that women may conceive even as late as their fifty-ninth year.* In the first set of cases, it is easy to recall instances in illustration of "the pertinacity and apparent innocence" with which unmarried women will sometimes deny the possibility of pregnancy even when they are actually in labour.

In the case of an unmarried woman the greatest caution is necessary before expressing an opinion that the patient is pregnant; by a little waiting the case settles itself, and in doubtful conditions nothing is to be gained by giving an opinion straight away, whereas two months is, as a rule, sufficient to lead the patient thoroughly to realise her condition, and she may not, in the circumstances, deem it necessary to trouble the surgeon a second time.

The existence of an abdominal swelling, associated in a young healthy woman with fulness of the breasts and amenorrhœa, is a combination of signs always sufficient to put us on our guard; and if on auscultation the fœtal heart sound and the uterine bruit can be heard; or the rhythmical contraction characteristic of a gravid uterus be perceived when the hand is placed flat upon the suspected tumour and maintained in that position for some minutes, the diagnosis

* *See* Derasse, *Brit. Med. Journal*, "Epitome," 1891, Oct. 24.

is not very doubtful. These, apart from other minor signs which can be taken into consideration, are not likely to mislead a careful practitioner.

To mistake a gravid uterus for an ovarian tumour is an awkward blunder, but it is even more unpleasant to err in the converse direction and declare a young unmarried woman with an ovarian tumour to be pregnant. Judging from my own observations on the cases sent up as abdominal tumours, which on careful and systematic examination turn out to be unmistakable cases of pregnancy, it is not that the characteristic signs are wanting, but that those who previously examined the patients have failed to appreciate them; and it betrays weakness to urge, in extenuation of such errors, that older, wiser, and more experienced men have blundered equally.

Two rules should be observed in dealing with cases of suspected pregnancy:—(1) When in doubt, defer expressing an opinion, and see the patient again after a few weeks' interval. (2) **Never pass a sound when there is even a suspicion of pregnancy.**

(*b*) **Hydramnios.**—This abnormal form of pregnancy very closely simulates a large, rapidly-growing ovarian cyst. Hydramnios is due to an excess of amniotic fluid. The amount of fluid within the sac of the amnion at birth varies in different cases, and although it probably rarely exceeds 250 cc., it may amount to half a litre without being regarded as pathological.

McClintock * wrote an interesting account of this condition under the title of "Dropsy of the Ovum," and limits the term to cases in which the quantity of fluid exceeds 2 litres. The first case he describes is that of "a lady, aged thirty-three, in her tenth pregnancy, who enjoyed good health up to the beginning of the seventh month of utero-gestation. The abdomen then began to increase in a rapid manner, and in a fortnight attained such proportions as to produce pain and distress. The patient was free from anasarca, the belly was immensely swelled, tense, and obscurely fluctuating. She was uneasy in any attitude or position.

"On making an internal examination, the membranes were protruding through the os, extremely tense, and no

* "Diseases of Women," 1863.

presentation of the fœtus distinguishable. The membranes were torn, 'whereupon a volume of water instantly gushed out, and almost at the same time the head of the fœtus. Its birth was retarded as much as possible, but the temporary obstruction caused by the child being removed, the torrent began afresh, filling every available vessel, and deluging the bed and floor within the brief space of a minute or two.'"

McClintock mentions the fact that when it affects a woman with twins, "we usually find that the amnios of one child only is engaged." This he observed in *eleven* twin cases in which the disease was present, and further points out that in thirty-three cases where he particularly noted the facts, five were first labours, eight were second labours, one a twelfth, and the rest intermediate. Subsequent observations indicate that this remarkable condition is most frequently associated with twins. The fœtus is malformed, *hydrocephalus* being the most common abnormality; it comes on usually about the *sixth or seventh month.* Its onset may be gradual, but more frequently the fluid rapidly accumulates. Clinically, it presents all the features of a very large *ovarian cyst,* but may be distinguished from it by the existence of the signs of pregnancy, and *ballottement* is particularly distinct.

It is of importance to be aware of this condition, for it has in several instances been overlooked, and the uterus tapped under the supposition that it was an ovarian cyst; abortion follows the tapping, and more than one case has terminated fatally.

When there is difficulty in determining between a large ovarian cyst or hydramnios, the use of the uterine sound will settle the diagnosis.

(*c*) **Hydatid Pregnancy** (so-called).—This curious condition is rarely a source of doubt in diagnosis in so far as ovarian tumours are concerned. There is usually a history of temporary amenorrhœa on which menorrhagia supervenes. A little waiting invariably clears up the case.

(*d*) **Retroversion of the Gravid Uterus.**—This means that the fundus of the uterus is lodged in the hollow of the sacrum, and is prevented from rising on account of the sacral promontory. As the uterus enlarges the cervix is raised and pushed forward, compresses the urethra, and causes retention,

often accompanied by incontinence (*ischuria paradoxica*). The clinical signs of a gravid uterus in this condition are very decided. First, there is the presence of an oval hypogastric tumour, the *over-full* bladder, a history of pregnancy between the third and fourth month; and on examination a rounded elastic swelling (the body of the uterus occupying the hollow of the sacrum) will be felt, whilst the cervix lies behind the pubes, and sometimes so high that the finger can scarcely reach it. On passing a catheter and emptying the bladder the hypogastric tumour disappears. On examining the abdomen bimanually the fundus of the uterus cannot be detected. These facts serve to distinguish an incarcerated uterus from uterine myomata, tubal pregnancy, or ovarian tumour, for in all these conditions, when the cervix lies behind the symphysis, the fundus of the uterus can be felt through the anterior abdominal wall. The diagnosis is usually verified by rectifying the position of the uterus. After emptying the bladder, upward pressure on the uterus through the vagina will cause it to ascend. Sometimes it will be necessary to administer an anæsthetic.

Ovarian Cysts sometimes co-exist with Pregnancy.—A woman known to have an ovarian tumour subsequently becomes pregnant; such a case may give rise to no difficulty in diagnosis. When a patient comes under observation for the first time with the two conditions co-existing, we have to deal with a combination of circumstances that may mislead the most wary. In many cases the condition of the uterus has not been suspected until the abdomen was opened to remove the ovarian tumour, and even then the enlarged uterus has been mistaken for a cyst and punctured.

The *diagnosis* of an ovarian cyst complicating pregnancy is based upon the existence of the signs of a tumour *plus* those of pregnancy. When the tumour is large the abdomen is more widened out laterally than in simple pregnancy, and there is commonly a depression between the rotundity presented by each tumour.

In many instances the tumour is of moderate dimensions, and becomes impacted between the gravid uterus and the pelvis. Such has been mistaken in the early months of gestation for a retroverted gravid uterus.

An Ovarian Cyst mistaken for Pregnancy.—Occasionally an ovarian cyst arising during the child-bearing period of life will grow so rapidly as to simulate pregnancy. An example of this is given on page 82.

(*e*) **Uterine Myomata.**—These equal, if they do not excel, ascites and pregnancy in simulating ovarian tumours. Many of the largest and heaviest abdominal tumours grow from the uterus.

Not infrequently a myoma grows from the anterior or posterior wall of the uterus, and forms a large pedunculated, smooth, movable tumour, occupying the flank. When such a tumour undergoes mucoid softening and forms a spurious cyst—the so-called *fibro-cyst* of the uterus—the signs of an ovarian cyst are well imitated.

In rare instances a myoma springs from the side of the uterus and pushes its way between the layers of the broad ligament, and then, rising in the abdomen, forms a mass which has been known to weigh 10 kilogrammes or more.

Large uterine myomata may co-exist with ovarian cysts; and lastly, a uterus with myomata in its walls may become gravid. The diagnosis is still further complicated by the fact that a myoma of large size occasionally arises in the ovary; and in order to indicate the difficulty which sometimes besets diagnosis, tumours have been removed and the operation completed under the belief that they were ovarian, but subsequent dissection of the parts has shown that the tumours were of uterine origin.

The *age* of the patient sometimes throws light on the case, as uterine myomata are excessively rare before the twenty-fifth year, uncommon before the thirtieth year, but very frequent after that period of life.

The physical signs of large uterine myomata are in some points identical with those of ovarian tumours. As a rule, uterine tumours occupy the middle of the abdomen, but pedunculated myomata will sometimes lie in the flanks, like ovarian tumours. To palpation they may be perfectly smooth; frequently they are irregular and tuberose (this is a valuable sign). Uterine, like ovarian, tumours are dull on percussion; the dulness ceases abruptly at the borders of the tumour, and the flanks are resonant in all positions of the patient.

Auscultation is frequently valuable; myomata, especially those which grow rapidly, often yield a loud venous *murmur* when auscultated. This important aid to diagnosis is present in about half the cases. It has been said to occur occasionally in ovarian tumours. I have, as yet, failed to detect it. The murmur is synchronous with the pulse; firm pressure may increase the sound, but sometimes obliterate it. The murmur is usually best heard with an ordinary wooden stethoscope. Often it is as convenient to cover the abdomen with a sheet and apply the ear alone. Frequently the murmur may be heard all over the swelling; occasionally it is limited in its distribution. In some cases the murmur will be only audible a few days before the onset of a menstrual period.

A pelvic examination furnishes important information in cases of uterine myoma, for the tumour will be found to have close relations with the uterus. When the examining finger is firmly fixed upon the cervix and the tumour moved by the free hand, the cervix and tumour will move together. Frequently the whole uterus and cervix form a rounded globular mass, occupying nearly the whole available pelvic space, and in the place of an elongated cervix simply a dimple will be found at the top of the vagina, representing the cervix and os uteri.

Sometimes the uterine sound will be of assistance. In most cases of myoma the cavity of the uterus is elongated, whilst in ovarian tumour this is rarely the case. Again, the sound may give information of the position of the tumour: whether it grows from the fundus, front or back of the uterus, or involves the whole organ. The sound is an instrument that requires extreme care, and it should be remembered that a uterus with myomata in its walls sometimes becomes gravid.

Another distinguishing feature of myomata is **menorrhagia,** and this is a very important clinical sign; it is rarely associated with ovarian cysts. Uterine myomata exist without this accompaniment, but when a woman comes under observation with a large abdominal tumour, and complains of menorrhagia recurring at frequent intervals, and presents an anæmic appearance, the tumour in the majority of cases is a uterine myoma.

When free hæmorrhage follows even the gentle use of the sound, it is often an indication that there is a submucous myoma projecting into the uterine cavity.

Ovarian tumours rarely interfere with either the bladder or rectum, yet both conditions occur in uterine tumours. When very large, they compress the parts at the pelvic brim; and when of moderate dimensions they become "locked" in the pelvic cavity and exert pressure on the rectum, and compress the neck of the bladder, leading to retention of urine. Hence pressure symptoms occur most frequently with myomata of moderate dimensions restricted to the pelvis (Fig. 145).

When an ovarian cyst is associated with a myoma of the uterus, it is extremely difficult to decide whether the second tumour is a pedunculated myoma or an ovarian cyst. Some forms of soft rapidly-growing myomata will yield a false percussion wave simulating a cyst containing thick tenacious fluid; and a large uterine myoma will still further simulate an ovarian cyst when it has undergone extensive mucoid softening, and forms what is sometimes called a fibro-cystic tumour of the uterus.

In spite of the most careful examination, it is sometimes impossible to decide between an ovarian tumour and a uterine myoma; under such conditions the surgeon explores the parts through an abdominal incision.

The following combinations should be borne in mind:—

(1) *Pregnancy and ovarian tumours (unilateral and bilateral).* (*See* tables E, F, and G, pages 187–189.)

(2) *Tubal pregnancy and ovarian tumours.*

(3) *Uterine myoma and ovarian tumours, single and double, usually the latter.*

(4) *A pedunculated uterine myoma and pregnancy.*

When an ovarian cyst and a myoma of the uterus co-exist, ovariotomy should be performed, and the second ovary, whether diseased or not, should be removed, so as to induce an artificial menopause. Such procedure has been followed by the most satisfactory results, the uterine tumour disappearing. In most cases where ovarian cysts complicate uterine myomata, both ovaries will be found diseased.

When ovarian cysts co-exist with uterine myomata,

especially when both ovaries are cystic, rotation of one of the cysts is very liable to occur.

(*f*) **Retention Cysts.**—When, from any cause, the cervical canal is permanently obstructed, the secretions, inflammatory exudations, and (at certain periods of life) menstrual fluid are retained, and dilate the cavity of the uterus until it attains a formidable size. Retention cysts of the uterus are of three varieties, according to the nature of the retained fluid, and are expressed by the terms hydrometra, pyometra, and hæmatometra.

Hydrometra.—The commonest cause of this condition is cicatricial occlusion of the cervical canal or vagina, the result of injury during parturition. The secretion from the glands accumulates and distends the cavity of the uterus; coincident with this, the walls thicken, until at last the organ attains a large size and may mimic pregnancy or a myoma.

Pyometra.—This is occasionally a sequel to hydrometra, in consequence of putrefactive organisms gaining access to its highly albuminous contents, and establishing suppuration with all its attendant evils. Pyometra is more frequent than hydrometra, and is an occasional complication of cancer of the cervix. *Hydrometra and pyometra are frequent complications of a bicorned uterus; both cornua may be affected, or the distension may be limited to one cornu.*

Hæmatometra.—This is usually secondary to hæmatokolpos; but the hæmatometra is sometimes caused by congenital stenosis of the vaginal segment of the cervical canal.

In well-marked cases of distension of the uterus, secondary to obstruction at the external os, the effects upon this organ are very striking, and are the reverse of the conditions observed when the uterus is gravid. In the latter condition the enlargement affects the body and fundus; whereas in hydrometra and hæmatometra the cervical canal is distended sometimes to a great size, and resembles a ball, on which the external os may be perceived as a small dimple, whilst careful examination of the hypogastric region will lead to the detection of the fundus raised out of the pelvis by the dilated cervix.

When the obstruction is at the internal os, then the uterine cavity enlarges and resembles a gravid uterus in an early stage, and the cervix will be found protruding as usual into the vagina.

The signs and treatment of hæmatometra are identical with those described under hæmatokolpos, except that the patient has a normal vagina. This will induce the practitioner to exercise greater caution in diagnosis, as the association of amenorrhœa with a slowly-increasing swelling in the belly in a girl or young woman may lead to the suspicion of pregnancy.

Hydrometra and pyometra in adult females simulate uterine myomata, and are especially difficult of diagnosis when occurring in one half of a bicorned uterus. An examination of the cervix through a speculum, and inability to pass a sound, will reveal the existence of an obstructed cervical canal, and furnish a clue as to the probable nature of the enlargement.

Hæmatokolpos.—This term is applied to distension of the vaginal canal with retained menstrual fluid. The retention depends on occlusion of the lower end of the vagina, which may be due to—(1) imperforate hymen; (2) cicatricial stenosis of the vagina or the vulva.

Hæmatokolpos is usually discovered by the mother becoming aware that her daughter has reached the age when menstruation should declare itself, yet its most obvious manifestation—the periodical escape of blood from the vagina—is absent. Nevertheless, the girl suffers from recurring periodical abdominal pains and discomfort, accompanied by a gradual enlargement of the lower part of the abdomen; this leads to an investigation.

When the retention is due to an imperforate hymen, this membrane will be observed, on inspection, stretched across the vulval orifice; and sometimes it will present a convex contour, which bulges when pressure is made on the belly immediately above the symphysis.

In cases where the hæmatokolpos forms a very large tumour, the fundus of the uterus is carried out of the pelvis, and is pushed forward into contact with the anterior abdominal wall some distance above the pubes.

Hæmatokolpos is often associated with distension of the uterine cavity with menstrual fluid—*hæmatometra.*

It is obvious that these conditions very rarely complicate the diagnosis of ovarian tumours; however, it is necessary to bear them in mind in determining the nature of pelvic tumours. Further, the consideration of retained menses is a necessity, because in some cases of hæmatometra and hæmatokolpos it has been found imperative to induce an **artificial menopause.** (*See* chapter l.)

Echinococcus cysts of the uterus are considered in chapter xlvii.

CHAPTER XX.

THE DIFFERENTIAL DIAGNOSIS OF OVARIAN TUMOURS (*concluded*).

THE morbid conditions of abdominal viscera which are apt to simulate the physical signs of an ovarian tumour are by no means few, and it will be necessary to consider each viscus separately.

The Kidney.—In the early days of ovariotomy no organ, except the uterus, so often misled operators in the diagnosis of ovarian cysts. The great advance made in renal surgery during the last twenty years has been accompanied by increased accuracy of diagnosis, and now it rarely happens that renal and ovarian tumours are confounded; nevertheless, there are conditions in which the simulation is so complete that even the wisest hesitate to commit themselves to a positive opinion.

There are many abnormalities of the kidney which require to be borne in mind in the differential diagnosis of ovarian tumours:—

(*a*) Hydronephrosis.
(*b*) Sarcomata.
(*c*) Movable kidney.
(*d*) Single kidney.
(*e*) Misplaced kidney.
(*f*) Echinococcus cysts.

(*a*) **Hydronephrosis.**—Difficulty in deciding between hydronephrosis and an ovarian cyst arises in two ways. A large hydronephrotic cyst may, and often does, extend downwards into the iliac fossa, and even come into contact with Poupart's ligament, whilst an ovarian tumour (especially a dermoid) with a long pedicle will sometimes occupy the loin.

Le Bec* removed an ovarian cyst through an incision in the loin, under the impression that he was dealing with a hydronephrotic cyst. It must also be remembered that

* *Gaz. des Hôpitaux*, 1887, p. 290.

hydronephrosis sometimes co-exists with, and is occasionally caused by, an ovarian tumour, especially when impacted in the pelvis. The interesting abnormality of the kidney known as "congenital cystic kidney" (Fig. 78) is occasionally met with in adults, and has complicated the diagnosis of an ovarian tumour.

The physical signs of renal tumours are very characteristic. There is a swelling in one or both loins, which yields a dull

Fig. 78.—Congenital Cystic Disease of the Kidney, in section. One-third natural size. (Museum, Royal College of Surgeons.)

sound on percussion, but as both kidneys have the colon in contact with their anterior surfaces, an area of resonance is usually present when they are percussed from the front. It is exceptional for an ovarian cyst to have intestine in front of it, but this may happen when the cyst is small and does not displace the bowel, and when adhesions form between a coil of intestine and the anterior surface of the tumour.

In addition to these signs, an examination of the urine furnishes valuable evidence; it may be scanty in amount,

and contain blood, pus, mucus, or yield other evidence of renal disease sufficient to afford the practitioner valuable indications of the nature of the swelling. Another symptom,

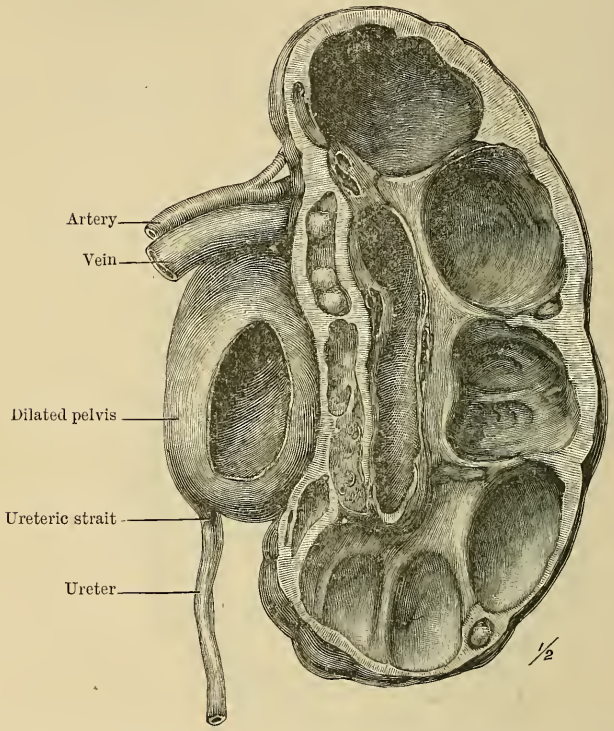

Fig. 79.—Large intermitting Hydronephrosis which simulated an Ovarian Cyst.

which is sometimes valuable, is that in cases of hydronephrosis the tumour may intermit, the intermittence being known by diminution in the size of the tumour, accompanied by an abundant flow of urine. The case from which the kidney represented in Fig. 79 was taken illustrated this very well. Some days the swelling was large and exhibited all the physical signs of an ovarian cyst; partial intermission would occur, and the half-emptied cyst then gave the typical signs of hydronephrosis. This condition is not so valuable as it would at first sight appear, because an ovarian hydrocele and a large hydrosalpinx are liable to intermit, *and an intermitting renal*

cyst is simulated by rupture of an ovarian cyst, followed by diuresis. (*See* page 132.)

(*b*) **Renal Sarcomata.**—Very large solid tumours of the kidneys have in a few instances been regarded as ovarian tumours until inspection through an incision in the belly wall has made plain the true nature of the condition.

(*c*) **Movable Kidneys.**—A movable kidney will simulate an ovarian tumour with a long pedicle and *vice versâ*. I know of one case in which a surgeon, thinking he had to deal with a

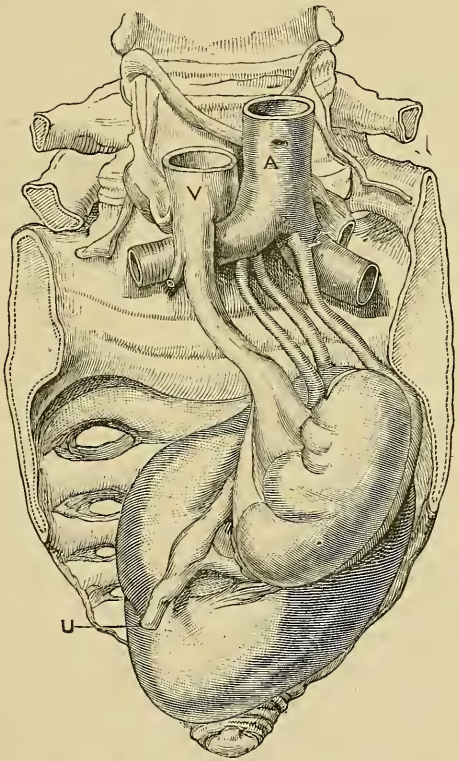

Fig. 80.—Kidney occupying the Hollow of the Sacrum. (Museum, Middlesex Hospital.)
A, Artery; V, vein; U, ureter.

cystic kidney, made an incision in the left linea semilunaris at the level of the navel and found the tumour to be ovarian; its pedicle was so long that he successfully removed it through this opening.

(*d*) **Single Kidney.**—When an individual possesses one kidney it is almost invariably double the normal size. I was once present at an operation for the removal of a supposed ovarian tumour, but when the abdomen was opened a single large kidney was found. A horse-shoe kidney has caused difficulty in differential diagnosis.

(*e*) **Misplaced Kidney.**—It is a well-established fact that a kidney may be so misplaced as to occupy the hollow of the sacrum (Fig. 80). In this situation it lies behind the peritoneum. It is conceivable that if a woman complaining of pelvic trouble submits to physical examination, and has a kidney in the hollow of her sacrum, the case would give rise to some difficulty in diagnosis, especially if such a kidney became cystic.

It is an extraordinary fact that I received within the space of three months two kidneys, removed by the same operator from the hollow of the sacrum. One of the kidneys had a large cyst connected with it. The patients were women, and in each instance they were supposed to have an ovarian cyst. In the course of the operations it was noticed that the erring organs lay behind the peritoneum.

(*f*) **Echinococcus Cysts.**—Enlargement of the kidney due to the presence of this parasite in the connective tissue of the renal pelvis usually simulates hydronephrosis. Its differential diagnosis is attended with great difficulty, except in those rare cases in which the cyst opens into the renal pelvis and the vesicles are conveyed by the ureter to the bladder. The cyst wall has occasionally been found calcified.

The Spleen.—Since splenectomy has become sufficiently successful to rank among justifiable operations, surgeons have been led to pay more attention to variations in the size and the position of this curicus viscus; hence it is possible, from the great number of cases carefully reported within the last ten years, to demonstrate that the spleen, with fair frequency, complicates the diagnosis of abdominal tumours.

The spleen has simulated an ovarian tumour in the following conditions:—

(*a*) Enlarged spleen.

(*b*) Wandering spleen.

(*c*) Cysts of the spleen

(*a*) **Enlarged Spleen.**—When the spleen is enlarged in leucocythæmia or in the condition known as "hypertrophy," it has many times been mistaken for an ovarian tumour, and the error only discovered when the abdomen was opened.

When enlarged, the spleen forms a tumour, extending from the left hypochondrium obliquely downwards to the umbilicus, and as far as the pelvis when very large. It gives rise to dulness on percussion, moves up and down with the diaphragm in respiration, lies in front of the colon, and presents a characteristically notched border.

(*b*) **Wandering Spleen.**—The pedicle of a "wandering" spleen may be so long that this organ may occupy any region of the abdomen and can be moved about by manipulation almost as easily as a free body.

Two examples of wandering spleen have come under my notice.* The first was in a woman twenty-three years of age; its mobility led one very experienced surgeon to regard it as an ovarian tumour with a long pedicle. At the operation the spleen was lodged in the pelvis, its lower end touching the uterus. The organ had undergone axial rotation, its pedicle being twisted three and a half times. It is of interest in relation to this case that the rotation of the spleen produced symptoms identical with those observed when ovarian tumours undergo acute axial rotation.

Rokitansky,† in an interesting but in England very inaccessible publication, has described some examples from the dead-house. In one instance he found a spleen, which had undergone *axial rotation* and strangulation of its vessels, adherent to the entrance of the pelvis.

In 1895 Dr. Heywood Smith placed under my care a woman, thirty-two years of age, on account of wandering spleen. At the operation we found the organ lying on the floor of the pelvis behind the uterus. ‡

Varneck § has recorded a remarkable case in which a woman twenty-one years of age sought relief on account of a hypogastric tumour. Cœliotomy was carried out, and a

* Trans. Clinical Soc., vol. xxvi. p. 46.

† *Zeitschrift der K. K. Gesellschaft der Aerzte*, Wien, 1860, Nr. iii.

‡ *Lancet*, 1895, vol. ii. p. 974.

§ *Journal Brit. Gyn. Soc.*, 1894, p. 410.

tumour supposed to be a subserous fibroma was found adherent to the abdominal wall, posterior surface of the uterus, and omentum. It was removed. Microscopical examination of the fragment revealed the fact that the suspected fibroma was a spleen!

A study of the records of splenectomy shows that enlarged spleens are more often confounded with uterine myomata than with ovarian tumours. The converse error of regarding a uterine myoma or an ovarian cyst as an enlarged spleen has been committed. Mistakes of this kind show the extreme fallibility of diagnosis in regard to abdominal tumours founded on physical examination.

(*c*) **Cystic Spleen.**—There are two kinds of cystic spleen; in the rarer, the spleen greatly enlarged consists of a number of loculi lined by smooth membrane; the cavities differ greatly in size; some are as small as cherries, whilst others will accommodate easily an orange.

The second, but by no means common kind, is the echinococcus cyst. In some instances echinococcus colonies of the spleen attain very large proportions.

The Liver.—This viscus when enlarged, either from fatty degeneration, cancerous deposits, cystic disease, or echinococcus cysts, has been mistaken for an ovarian tumour. Sir Spencer Wells once explored an abdomen expecting to find an ovarian cyst, but it was a liver enlarged from cystic disease.

(*a*) **The Gall-bladder.**—It seems difficult to believe that the gall-bladder could possibly give rise to error in the diagnosis of ovarian cysts. Yet Lawson Tait* relates a case in which a woman forty years of age came under his care with an abdominal tumour which presented the physical signs of a parovarian cyst. He performed abdominal section, making an incision 5 cm. long in the middle line below the umbilicus, and writes:—"On emptying the tumour, I found, to my amazement, that it was a gall-bladder enormously distended." On exploring the cyst, "a gall-stone as large as a filbert-nut impacted in the neck of the gall-bladder was found." Two or three smaller gall-stones were found in the cavity of the cyst. The edges of the opening in the

* *Edin. Med. Journal*, Oct., 1889, p. 315.

gall-bladder were stitched to the abdominal wound. Bile began to flow from the wound on the morning of the third day after the operation. The patient recovered. The fluid contents from the cyst measured about six litres, and consisted of clear gluey fluid.

In 1891 I assisted a surgeon in an operation for the removal of a tumour, supposed to be ovarian, with a twisted pedicle. On opening the abdomen, the tumour occupied the right loin and was thought to be of renal origin. It was then explored through the loin, but a healthy kidney was found unconnected with the tumour. The tumour was then aspirated through the abdominal incision and found to be a gall-bladder distended in consequence of calculi impacted in the cystic duct.

(*b*) **Echinococcus Cysts** (hydatids).—When these cysts occur in the liver, omentum, kidney, and mesometrium, and attain a large size, they are particularly apt to be mistaken for ovarian cysts. When of small size, echinococcus cysts of the liver do not give rise to difficulty, but it is when they attain large proportions, displace the viscera, and dip into the pelvis that they simulate ovarian cysts. Hydatid cysts are rarely attended with pain or uneasiness, and it generally happens that attention is first called to them by the patients or their friends noticing the more or less unsymmetrical swelling of the abdomen. These tumours when they project the surface of the abdomen appear as rounded, tense, elastic swellings, free from pain or tenderness when uninflamed. They fluctuate distinctly, and a peculiar sign—the *hydatid fremitus*—can sometimes be obtained by placing the palm of the left hand upon the tumour and sharply percussing with the fingers of the right; it is a peculiar tremor or thrill, only felt over a hydatid cyst. The sign is rarely obtained satisfactorily. These cysts sometimes suppurate, and all the signs indicative of an abscess are present. When aspirated, the character of the fluid quickly settles the question, for it is non-albuminous, clear, probably contains scolices, or hooklets, and chloride of sodium. It is neutral or slightly alkaline; specific gravity varies from 1008 to 1013. Often fragments of the characteristic laminated lining of the cyst will come away. A large echinococcus colony of the liver may co-exist

with similar cysts in the omentum, varying in size from a walnut to an orange. Multiple cysts sometimes give rise to the suspicion of malignant disease.

Echinococcus cysts of the liver occasionally attain such large proportions as to reach and even occupy the pelvis. Bryant* has recorded an instructive example of this. A woman thirty-five years of age was admitted into Guy's Hospital in 1868, under the care of Dr. Oldham, with an abdominal tumour, which had been slowly growing for fourteen years. In 1861 Oldham, under the impression that the cyst was ovarian, tapped it, and drew off four litres of fluid. The cyst refilled, and continued to increase in size until her condition rendered it necessary to resort to some effectual mode of treatment. The physical signs presented by the cyst did not quite accord with an ovarian tumour. "On kneading the mass with the hand on either side, a peculiar doughy sensation was felt, unlike what is usually present in ovarian disease, but yet unlike what is usually felt in a hydatid cyst." When the abdomen was opened and the cyst punctured, it was ascertained to be an echinococcus colony.

The precise origin of this cyst was never accurately ascertained, as the patient recovered.

Stomach.—Abnormal conditions of this viscus may complicate ovarian diagnosis, directly or indirectly. Such cases are not unknown. Thus Dr. Galabin† has recorded an experience illustrating this. "A patient had been sent into Guy's Hospital, under one of his surgical colleagues, with a history that she had been tapped for ovarian tumour, and the fluid had re-collected. On examination, there was evidently a large space containing fluid and gas, and giving a succussion splash. Dr. Galabin was not disposed to think that the fluid was contained in a cyst. At an exploratory operation, however, it was thought that there was an irremovable ovarian cyst, and the supposed cyst wall was stitched to the abdominal wound. Not long after, food began to escape through the wound soon after it was taken. The patient died, and at the autopsy it was found that a pseudo-cyst had been

* *Ed. Med. and Surg. Journal*, vol. xxii. p. 253, 1824.

† Trans. Obstet. Soc. London, vol. xxix. p. 150.

formed by peritoneal adhesions, and that there was a fistulous opening into it from the stomach."

Omentum.—The morbid conditions of the omentum which simulate ovarian tumours are:—(*a*) Echinococcus cysts (hydatids). (*b*) Simple cysts (hydroceles). (*c*) Large lipomata. (*d*) Colloid disease. Attention has already been drawn to the fact that ovarian cysts and dermoids may become detached from their mesometric connections and become engrafted on the omentum (page 124).

(*a*) **Echinococcus Cysts.**—The omentum is a very common situation for these cysts. Occasionally they simulate ovarian cysts. When multiple, which is the usual condition, they are more likely to be mistaken for secondary deposits of cancer.

(*b*) **Omental Hydroceles.**—Under normal conditions, the lesser cavity of the peritoneum extends into the great omentum; occasionally, this space becomes distended with fluid, and, its communication with the upper area of the lesser cavity becoming cut off, the omental space is isolated and converted into a cyst; as it has been the custom to term fluid accumulations in peritoneal diverticula hydroceles, the most suitable term for these cysts is Omental Hydrocele.

The museum of the Royal College of Surgeons contains two very good examples. The largest specimen was removed by Dr. Bantock; it had been several times tapped by Mr. Goodall-Copestake under the impression that it was an ovarian cyst. It contained several litres of dark serous fluid.

(*c*) **Lipoma.**—Fatty tumours of huge size grow from the omentum; they are sometimes mistaken for ovarian cysts. Meredith* successfully removed one from a woman sixty-two years of age; the tumour weighed about seven kilogrammes. The tumour was supposed to be ovarian, and it was with this view that its removal was undertaken.

(*d*) **Colloid Disease.**—In this peculiar and rare affection the omentum becomes thickened so that it may weigh upwards of six kilogrammes, and as it assumes a convex outline it strikingly simulates an ovarian tumour, and has deceived more than one shrewd and experienced surgeon.

Chyle Cyst of the Mesentery has been mistaken for an ovarian or parovarian cyst. An interesting instance of this

* Trans. Clin. Soc., vol. xx. p. 206.

was communicated to the Obstetrical Society, London, by Dr. Adolph Rasch.* The patient was a Jewess, twenty-one years of age. A large roundish elastic swelling occupied mainly the left side of the abdomen. The rounded top of the swelling was about 5 cm. above the horizontal umbilical line. When the abdomen was opened the appearance of the tumour at once struck all present; it was of a pale pink and very glossy, unlike any cyst he had seen before. No adhesions could be felt anywhere. On piercing it with a large trocar, a perfectly milk-like fluid squirted out with great force; on drawing the walls of the cyst gently out, it became evident that what appeared to be a cyst was the two layers of the mesentery separated from each other by the milk-like fluid. The small intestine of perfectly natural appearance was connected with the mesentery in the usual way. The hand inside came down to the region of the spine at the usual insertion of the mesentery. The inside of the cyst was intensely congested, looking dark red, and freely oozing. The edges of the cyst were stitched to the skin wound; the patient recovered.

Cysts similar to this have been reported by Bergmann,† Mendes de Leon,‡ and Fetherston.§

Fæcal Accumulation (coprostasis).—This occurs most frequently in the colon and sigmoid flexure. The transverse colon, when U-shaped and distended with fæces, may occupy the hypogastric region. "Fæcal tumours" may occupy any part of the abdomen. Usually they are easily recognised, as they are dull on percussion, doughy to the feel, and readily receive the imprint of the finger-tip. Repeated copious enemata quickly settle the nature of the tumour. The belly has been opened for the removal of such a mass under the belief that it was an ovarian tumour.

Pancreatic Cysts.—These are rarely likely to give rise to difficulty, even those large collections of fluid described as pancreatic cysts, which are probably due to collections of fluid in the lesser bag of the peritoneum.

* Trans. Obstet. Soc., vol. xxxi. p. 311.

† *Arch. für klin. Chir.* (von Langenbeck), 1887, s. 201.

‡ *American Journal of Obstet.*, vol. xxiv. p. 168.

§ *Australian Med. Journal*, 1890, p. 475.

Lawson Tait records a case in which he diagnosed a parovarian cyst in a young girl, and opened the belly to remove it. The swelling was an accumulation of fluid in the lesser bag of the peritoneum. At the *post-mortem* examination the mischief was found to be due to a seamstress's needle lying in the omentum over the foramen of Winslow. The patient was a lunatic. The parts are preserved in the museum of the Royal College of Surgeons, London.

Post-Rectal Dermoid.—Tumours of this kind in the hollow of the sacrum, behind the rectum and peritoneum, rarely exceed the dimensions of an orange. Mr. Frederick Page* met with a case in which a post-rectal dermoid was so large as to reach as high as the navel and simulate an ovarian tumour. The patient was a woman forty-seven years of age.

* *Brit. Med. Journ.*, 1891, vol. i. p. 406.

CHAPTER XXI.

TREATMENT OF OVARIAN TUMOURS.

The treatment of an ovarian tumour, including in this general term tumours of the oöphoron, paroöphoron, and parovarium, is *early removal.* It has been shown by an overwhelming amount of evidence that the earlier these tumours are removed—that is, before they have acquired complicated adhesions to important organs, or produced any dangerous pressure effects upon the kidneys—the more likely is the operation to be followed by success. Recent writers on ovarian disease have insisted upon the fact that the pernicious practice of tapping, formerly so much advocated, but now, fortunately, almost banished, renders subsequent operations for the removal of the cyst much more difficult, and therefore more dangerous to life.

Paracentesis, or Tapping, is now but rarely resorted to for ovarian cysts. Ovariotomy is such a successful operation that it involves little risk and is *curative,* whilst tapping is *palliative,* and often harmful.

Tapping is attended with several risks. If air be admitted into the cyst during the procedure, or the instrument be septic from want of care and cleanliness on the part of the operator, *inflammation* and *suppuration* of the cyst result, with all the attendant dangers.

The fluid may, in spite of care and caution, leak into the abdominal cavity; and should it possess infecting qualities, fatal *peritonitis* will be the consequence.

Should the cyst contain *papillomata,* as is so frequently the case with paroöphoronic cysts, epithelial elements may be disseminated broadcast over the peritoneum. Should these possess malignant characters, the significance of the accident is very obvious.

Should there be an error of diagnosis, and a large uterine myoma be stabbed with the trocar, the patient will be placed in imminent danger from *hæmorrhage.*

In some varieties of cysts the fluid will not run through the cannula, and in multilocular cysts it would be impossible to empty all the loculi.

Very exceptionally it may be requisite to tap an ovarian cyst where a patient is not in a condition to bear ovariotomy. A few writers recommend it when a patient is suffering from some intercurrent trouble, such as bronchitis, or where the pressure of the tumour causes anasarca of the lower limbs.

Under the latter condition it would seem more in accordance with general surgical principles at once to perform ovariotomy, especially when there is no reason to fear malignancy. I have performed ovariotomy under such conditions with the happiest results.

When it is judged really necessary to tap instead of performing ovariotomy, the safest instrument to use is the aspirator. Some of the records of cases in which patients have been tapped read almost like fables. (*See* page 133.)

There are very few contra-indications to ovariotomy; this operation is now performed under what would have formerly been regarded as prohibitive conditions. Some of these we will consider.

Inflamed and Suppurating Cysts.—The treatment of a *suppurating ovarian cyst* depends upon its situation. In acute suppuration of large cysts immediate removal of the tumour is the proper practice, and this was forced upon the profession by Dr. Keith.*

In December, 1864, a patient with a large tumour came under his care. She had been jolted for some hours in a coach; and, in the hope of relieving the pain thus set up, tapping was performed. The pain was not relieved; flatulent abdominal distension became excessive, and typhoid symptoms set in. Ovariotomy was performed during the semi-delirium of septic fever. The peritoneum was acutely inflamed and intensely livid. Recent lymph was everywhere present, and the cyst putrid. The operation lasted two hours. When the patient was placed in the bed she was cold, vomiting, and

* *Edinburgh Med. and Surg. Journal*, 1865, p. 673.

nearly pulseless. She regained heat rapidly, the delirium disappeared; there were warm perspiration, much sleep, and recovery without a drawback.

This was in 1864. Writing in 1875, Keith was able to give details of ten cases in which he had operated upon suppurating cysts with only one death. His boldness and enterprise were soon imitated by other surgeons, and the practice became established that suppurating ovarian cysts should be immediately removed.

The treatment of *ovarian dermoids*, when they have suppurated and opened into mucous canals, is not always so precise. In the majority of cases an attempt should be made to extirpate the tumour; and this method has been successful in a large number of instances, and the operation is not always difficult. In many cases the tumour is so bound down that its removal is impracticable. When such cysts have opened into the bladder or vagina, their contents may sometimes be successfully evacuated through the fistulous opening after dilatation of the vagina or urethra, as the case requires.

Hæmophilia.—Even in hæmophiliacs (bleeders) ovariotomy has been successful. Doutrelpont * has reported an interesting example in a woman thirty-seven years of age. Four weeks after operation bleeding occurred in the scar, but she recovered.

Ovariotomy in Old Age.—The first edition of this work contained a table of twenty-two cases of successful ovariotomy in women over seventy years of age. Since that date Howard A. Kelly and Mary Sherwood† made a collective investigation and succeeded in obtaining notes of one hundred cases of ovariotomy in women over seventy years of age; the death-rate amounted to 12 per cent.

In the present edition the accompanying table concerns itself with ovariotomy after the age of eighty years, and the results are truly remarkable notwithstanding the circumstance that women of eighty years and upwards have outlived their contemporaries and may be regarded as unusually healthy.

* *Berlin. klin. Woch.*, 1883, p. 337.

† The Johns Hopkins Hosp. Reports, vol. iii., 1894.

TABLE A.

OVARIOTOMY IN WOMEN OF EIGHTY YEARS OF AGE.

REPORTER.	AGE.	RESULT.	REFERENCE.
1. Owens . .	80	R.	*Journ. Brit. Gyn. Soc.*, vol. iv. p. 88.
2. Richardson .	80	R.	*Brit. Med. Journ.*, 1894, vol. i. p. 523.
3. Heywood Smith	81	R.	*Lancet*, 1894, vol. i. p. 1618.
4. Spencer . .	82	R.	*Brit. Med. Journ.*, 1893, vol. ii. p. 1271.
5. Homans . .	82	R.	*Bost. Med. and Surg. Journ.*, 1888, p. 454.
6. Edis . . .	81	R.	*Brit. Med. Journ.*, 1892, vol. i. p. 860.
7. Bush* . .	84	R.	*Brit. Med. Journ.*, 1894, vol. ii. p. 67.
8. Remfrey . .	83	R.	Trans. Obstet. Soc., vol. xxxvii. p. 152.
9. Kraft . .	84	R.	*Hospitalstidende*, Copenhagen.
10. Owens† . .	87	R.	*Lancet*, 1895, vol. i. p. 542.
11. Thornton . .	94	R.	Trans. Obstet. Soc., vol. xxxvii. p. 158.

Ovariotomy in Children.—The subjoined tables represent the extraordinary results of ovariotomy in children. The cases have been arranged in three groups, not merely for the purpose of exhibiting the good results with cysts and dermoids, and the disastrous consequences of ovariotomy for ovarian sarcomata, but also to throw in strong relief the relative frequency of dermoids in young subjects.

Further, ovarian sarcomata occur much more frequently in children before puberty than at any other period of life.

Another remarkable fact revealed by a study of these tables is the non-occurrence of **parovarian** and **papillomatous** cysts before puberty.

An analysis of the hundred cases gives the following results :—

Simple cysts and adenomata, 41 - -	3	deaths
Dermoids, 38 - - - - -	5	„
Sarcomata, 21 - - - - -	7	„

I have endeavoured as far as possible in the cases of *ovarian sarcomata* to ascertain the subsequent history. This has been forthcoming as regards seven of the patients: in at least three the remote results are not encouraging.

* The age was confirmed by documentary evidence.

† A second operation on the patient No. 1 in this list.

TABLE B.

Ovariotomy for Simple Cysts and Adenomata in Girls under Fifteen Years of Age.

REPORTER.	AGE.	RESULT.	REFERENCE.
1. Alcock	3 years	D.	*Lancet*, 1871, vol. ii. p. 850.
2. Schwartz	4	R.	*Arch. für Gyn.*, bd. xiii. s. 475.
3. Boldt*	4	R.	Proc. Path. Soc., New York, 1888, p. 63.
4. Syme	5	R.	*Australian Med. Journ.*, vol. xv. p. 442.
5. Lucas	7	R.	Trans. Clin. Soc., vol. xxi. p. 224.
6. Hamaker	7	R.	*New York Med. Journ.*, 1889, p. 288.
7. Chenoweth	7 3/3	R.	*Amer. Journ. of Obstet.*, vol. xv. p. 625.
8. Duchamp	8 1/2	R.	*Arch. de Tocologie*, 1884, p. 23.
9. Parkes	9	D.	*Internat. Journ. Med. Sci.*, 1890, p. 258.
10. Vincent	10	R.	*Lyon Médical*, t. lxxiii. p. 156.
11. Marion Sims	11 1/2	R.	Keating's "Cyclopædia," vol. iii. p. 735.
12. Kollock	11 3/3	R.	*Journ. American Med. Assoc. Chicago*, vol. xvii. p. 890.
13. Jüon	12	R.	*Gaz. Heb.*, 1869, p. 396.
14. Koeberlé	13	R.	*London Med. Record*, 1876, p. 90.
15. Bell	13	R.	*Lancet*, 1887, vol. i. p. 418.
16. Terrillon	13	R.	*Bull. Gén. de Thérap.*, t. cxv. p. 529.
17. Homans	13	R.	"Laparotomies," Boston, 1887.
18. Walter	13	R.	*Journ. Brit. Gyn. Soc.*, 1895, p. 51.
19. Hume	13	R.	Unpublished. (Private communication.)
20. Bryant	14	R.	*Guy's Hospital Rep.*, vol. xiv. p. 269.
21. Lazarevich	14	R.	Matvêef "Dis. on Ov. in Russia," 1886.
22. Thornton	14	R.	*Brit. Med. Journ.*, 1887, vol. ii. p. 594.
23. Parker	14	R.	Unpublished.
24. Platt	14	R.	*Maryland Med. Journ.*, vol. xxii. p. 446.
25. Homans	14	R.	"Laparotomies," 1887.
26. Terrier	14	R.	*Revue de Chir.*, 1885, p. 34.
27. Salin	14	R.	*Cent. für Gyn.*, bd. xv. s. 711.
28. Spencer Wells	15	R.	"Ovarian Tumours," 1882.
29. Lawson Tait	15	R.	"Diseases of the Ovaries," p. 319.
30. Homans	15	R.	"Laparotomies," 1887.
31. Terrier	15	R.	*Revue de Chir.*, 1886, p. 194.
32. Péan	15	R.	*Clin. Chir.*, 1885–86, 7th series.
33. Gould	15	R.	*Med. Press and Circular*, 1892, ii. p. 218. *Journ. American Med. Assoc.*, vol. xix. p. 139.
34. Stansbury Sutton	15	R.	
35. Kelly	15	R.	*Johns Hopkins Hospital Reports*, vol. iii. p. 672.
36. Aubert	15	R.	*Lyon Médical*, t. lxxiii. p. 156.
37. Omori and Ikeda	15	R.	*Centralbl. für Gyn.*, bd. xvi. p. 1009.
38. Keen	15	R.	*Journ. Brit. Gyn. Soc.*, 1893.
39. Omori and Ikeda	15	R.	*Ber. klin. Wochensch.*, 1890, No. 7.
40. Omori and Ikeda	15	D.	*Ibid.*
41. Péan	15	R.	*Clin. Chir.*, 1887–88, 8th series.

* This was a suppurating cyst; it was treated by incision and drainage.

TABLE C.

Ovariotomy for Dermoids in Girls under Fifteen Years of Age.

	REPORTER.	AGE.	RESULT.	REFERENCE.
1.	Roemer	1⅔ yr.	R.	*Deutsche med. Woch.*, Dec. 26th, 1883.
2.	Péan	2 yrs.	R.	*Clin. Chir.*, 1887–88, 8th series.
3.	Hooks	2½	D.	*Amer. Journ. of Obstet.*, vol. xix. p. 1022.
4.	Kidd	3	D.	*Ob. Journ. Gt. Brit.*, vol. viii. p. 241.
5.	Thornton*	4	R.	Med.-Chir. Trans., vol. lxx. p. 75.
6.	Péan	5	R.	*Clin. Chir.*, 1887–88, 8th series.
7.	Omori and Ikeda	8	R.	*Berl. klin. Wochensch.*, 1890, No. 7.
8.	Mears	6⅔	R.	*Philadelp. Med. Times*, Nov. 1, 1874, p. 44.
9.	Ewens	7	R.	Unpublished.
10.	Thornton	7	R.	*Brit. Med. Journ.*, 1881, vol. ii. p. 933.
11.	Cupples	7½	R.	*Rich. and Louisville Med. and Surgical Journ.*, Dec., 1874.
12.	Black	7½	R.	*Brit. Med. Journ.*, 1892, vol. ii. p. 933.
13.	Spencer Wells	8	R.	*Brit. Med. Journ.*, 1874, vol. i. p. 342.
14.	Mackenzie	8½	R.	*Dub. Journ. Med. Sci.*, 1888, vol. lxxxvi. p. 392.
15.	Polotebnow	9	R.	*Centralbl. für Gyn.*, 1887, s. 373.
16.	Omori and Ikeda	10	R.	*Centralbl. für Gyn.*, bd. xvi. s. 1009.
17.	Péan	11	R.	*Clin. Chir.*, 1887–88, 8th series.
18.	Marsh	12	R.	Clin. Trans. London, vol. xi. p. 175.
19.	Vincent	12	D.	*Lyon Médical*, t. lxxiii. p. 156.
20.	Péan	12	R.	*Clin. Chir.*, 1875–76, 2nd series.
21.	Griffiths	12	R.	Trans. Path. Soc., vol. xxviii. p. 196.
22.	Schultze	12	R.	*Deut. Zeitsch. für Pract. Med.*, 1876.
23.	Keith	13	R.	*Ob. Journ. Gt. Brit.*, vol. iv. p. 31.
24.	Thornton	13	R.	Med.-Chir. Trans., vol. lxx. p. 65.
25.	Jessop	13	D.	*Lancet*, 1871, vol. ii. p. 431.
26.	Haward	13¾	R.	*Lancet*, 1886, vol. i. p. 920.
27.	Mundé	14	R.	Trans. Am. Gyn. Soc., vol. ii. p. 1877.
28.	Homans	14	R.	"Laparotomies," Boston, 1887.
29.	Bantock	14	R.	Med.-Chir. Trans., vol. lxiv. p. 65.
30.	Koeberlé	14	R.	*Med. Record*, London, Feb. 15th, 1876.
31.	Koeberlé	14	R.	*Med. Record*, London, Feb. 15th, 1876.
32.	Omori and Ikeda	14	R.	*Centralbl. für Gyn.*, bd. xvi. s. 1009
33.	Homans	15	R.	"Laparotomies," Boston, 1887.
34.	Giraldes	15	D.	*Gaz. Heb.*, March 8th, 1867, p 105.
35.	Von Szabo	15	R.	*Arch. für Gyn.*, bd. xxxii. s. 193.
36.	Bantock	15	R.	Med.-Chir. Trans., vol. lxiv. p. 122.
37.	Omori and Ikeda	15	R.	*Berl. klin. Wochensch.*, 1890, No. 7.
38.	Walter	14	R.	Unpublished.

* This was a suppurating cyst; it was treated by incision and drainage.

TABLE D.

OVARIOTOMY FOR SARCOMATA IN GIRLS UNDER FIFTEEN YEARS.

REPORTER.	AGE.	RESULT.	REFERENCE.
1. Cameron	3½	D.	*Glasgow Med. Journ.*, 1889, p. 37.
2. Foerster	4½	R.†	*Amer. Journ. of Obstet.*, vol. xxxi. p. 80.
3. Page	6	R.	*Brit. Med. Jour.*, 1895, vol. ii. p. 1363.
4. Croom	7	R.‖	*Edin. Med. and Surg. Journ.*, 1893, p. 689.
5. Chenoweth	8	D.	*Amer. Journ. of Obstet.*, vol. xv. p. 625.
6. Gussenbauer	8	R.	*Wiener med. Woch.*, 1894, No. 17.
7. Malins	9	D.	*Lancet*, 1890, vol. i. p. 1174.
8. Forbes	9	R.	*Aust. Med. Journ.*, 1894, p. 397.
9. Leopold	9	R.*	*Centralbl. für Gyn.*, vol. xviii. s. 1171.
10. Wagner	10	R.	*Arch. f. klin. Chir.*, vol. xxx. s. 504.
11. Croom	11	R.§	Obstet. Trans. Edin., vol. xiv. p. 93.
12. Leopold	11	R.	*Centralbl. für Gyn.*, vol. xviii. p. 1171.
13. Kelly	12	R.	*Keating's Cyclopædia*, vol. iii. p. 739.
14. Leopold	13	R.†	*Centralbl. für Gyn.*, vol. xviii. s. 1171.
15. Wagner	13	D.	*Arch. f. klin. Chir.*, vol. xxx. s. 504.
16. Anderson	13	R.†	Unpublished.
17. Bode	13	R.‡	*Centralbl. für Gyn.*, vol. xviii. s. 1171.
18. Smith	14	D.	*Lancet*, 1874, vol. ii. p. 501.
19. Tsander	15	R.	*Vratch*, 1890, No. 48, p. 1087.
20. Thornton	15	D.	*Med. Times and Gaz.*, 1883, vol. i. p. 211.
21. Von Szabo	15	D.	*Arch. für Gyn.*, vol. xxxii. s. 193.

Mortality.—It is impossible to state with precision the mortality of an operation like ovariotomy. It has been shown over and over again that when the operation is undertaken by surgeons who have devoted attention to this class of surgery the risk is very small; indeed, ovariotomy generally may be described as the safest of the major operations of surgery. In skilful hands an uncomplicated ovariotomy is not attended with more risks than amputation of a mamma without removal of the axillary glands.

The forms of ovarian tumour which give the surgeon most anxiety are those with firm *pelvic adhesions;* papillomatous cysts which burrow deeply between the layers of the broad ligament; and lastly, *ovarian sarcomata.*

* Recurrence and death in a year.

† Recurrence and death in a few months.

‡ In good health a year later.

§ Died two years later in America: cause of death uncertain.

‖ Alive and well December, 1895.

It would be interesting to be able to state definitely the risks of operation in each class of tumour. This will be impossible until surgeons feel disposed to accept some definite method of classification and arrange their cases accordingly. Speaking generally, it may be said that, in experienced hands, the mortality varies from 5 to 10 per cent. Here and there a few operators have had a series of twenty, fifty, and even eighty-eight cases (Thomas Keith) without a death. This is very encouraging; but when large series of cases are collected, the average mortality I have stated will be maintained. With less experienced operators the mortality after ovariotomy will vary from 15 to 20 per cent.

CHAPTER XXII.

OVARIOTOMY DURING PREGNANCY AND THE PUERPERIUM.

When an ovarian tumour complicates pregnancy the life of the woman is imperilled throughout the whole of the term; the peril increases with each succeeding month of gestation and culminates in a climax with labour (or abortion). During delivery, however, mischief may be produced which is only appreciable in the puerperium. It will therefore be useful before discussing the treatment of such cases to consider the dangers of the complication under three headings:—

1. During Pregnancy.
2. At the Time of Labour.
3. During the Puerperium.

1. **During Pregnancy.**—The chief perils to be apprehended at this period are: (*a*) Axial rotation of the tumour; (*b*) rupture of the cyst; (*c*) incarceration of the tumour in the pelvis; (*d*) impediment to respiration.

(*a*) **Axial Rotation.**—The danger incident to axial rotation of an ovarian tumour during pregnancy has already been discussed in chapter xvi., and it may with advantage be re-stated that when each ovary has a tumour and pregnancy ensues, the chance of axial rotation occurring is more than doubled. The frequency with which twisted pedicles occur when ovarian tumours and pregnancy co-exist is shown in table E.

(*b*) **Rupture.**—It would naturally be inferred that when the belly is occupied by a large ovarian or particularly a parovarian cyst, the increasing pressure to which it is subjected by the gradual enlargement of the uterus would, in a certain proportion of instances, lead to rupture of the cyst or promote abortion. This certainly happens.

It by no means follows that this accident has a lethal effect; indeed, cases have been reported in which the cyst ruptured, the fluid has been absorbed and excreted; then the pregnancy ripened and safe delivery ensued. The cyst

afterwards slowly refilled and necessitated ovariotomy many months later. On the other hand, rupture has been followed by such severe effects that life has been jeopardised and, in many instances, destroyed.

(*c*) **Incarceration of the Tumour.**—The risks which women run from pregnancy complicated with an ovarian tumour differ with the position of the tumour. For instance, the tumour may lie above the uterus—this is the most favourable position; or it lies in the pelvis, and, as the uterus enlarges, the tumour becomes impacted (incarcerated) in the hollow of the sacrum. Should the tumour be cystic it will be very liable to rupture, or mechanically interfere with the functions of the rectum and bladder.

(*d*) **Respiratory Impediment.**—When a very large ovarian cyst and a gravid uterus are associated, the encroachment on the thoracic space is very considerable, and occasionally produces orthopnœa and dyspnœa. This has rarely been fatal to the mother because relief used to be afforded by tapping. The consequences have been disastrous to the fœtus, for under these conditions premature delivery ensues, and the fœtus is, as a rule, stillborn.

2. **At the Time of Labour.**—It is undeniable that in many instances women with ovarian tumours have passed through several pregnancies without mishap. A much larger proportion of cases may pass the nine months of pregnancy without inconvenience of any kind; but with the accession of labour, trouble is apt to begin. The dangers differ according to the position of the tumour.

When the tumour occupies the pelvis it offers mechanical impediment to delivery. The fœtus invariably dies in such circumstances. The following accidents may happen:—

(*a*) Rupture of the cyst.

(*b*) Rupture of the uterus.

(*c*) Rupture of the vagina.

(*d*) Extrusion of the tumour through the anus.

When the tumours lie above the uterus the accidents which may ensue are:—

(*a*) Rupture of the cyst.

(*b*) Axial rotation.

(*c*) Suppuration of the cyst.

The second series of accidents may be manifest during labour (or abortion), but in the majority of cases they give rise to symptoms

3. **During the Puerperium**, and the disturbance is usually attributable to that cloak for ignorance, "puerperal fever."

It will be necessary to deal with these two sets of conditions separately.

I. **The Tumour occupies the Pelvis.**—Ovarian tumours lodged in the pelvis are the most insidious and most dangerous because their presence is rarely suspected or known until the onset of labour. It is easy to understand that when an ovarian tumour of even moderate dimensions occupies the true pelvis, it will so encroach on the conjugate or transverse diameter, or both, that unless the cyst rupture, delivery in the natural method is impossible, and if it be a dermoid, such a semi-solid body offers an almost impassable obstruction.

(*a*) **Rupture of the Cyst.**—Many cases have been reported in periodical publications in which a cyst wedged in the pelvis has obstructed delivery, the practitioner has failed to push it up and has then tapped the cyst, or these methods have been averted by rupture of the cyst. Under these conditions the fœtus dies, and not infrequently requires dismemberment to allow of delivery. The danger to the mother is terrible, for in the majority of cases the damage to the cyst is followed by fatal peritonitis.*

(*b*) **Rupture of the Uterus.**—When an ovarian dermoid obstructs the passage of the fœtus it is not likely to rupture, and tapping is useless. The conditions are desperate, especially with a powerfully-contracting uterus.

Dr. Ogier Ward † recorded a case in which a cyst of the right ovary as large as a cocoanut prevented the head of the fœtus from entering the true pelvis; the **uterus** ruptured and the woman died.

(*c*) **Rupture of the Vagina.**—One of the most remarkable of these awful cases is that recorded by Berry.‡ A woman was taken in labour with her tenth child; as delivery was

* Playfair, Trans. Obstet. Soc., vol. ix. p. 69; Warn, Trans. Obstet. Soc., xi. p. 198; R. Barnes, *ibid.*, vol. xi. p. 201.

† Trans. Path. Soc., vol. v. p. 219.

‡ Trans. Obstet. Soc., vol. vii. p. 263.

obstructed by a tumour in the pelvis, the child was delivered by means of forceps. The same evening the patient felt something escape from the vagina during a fit of coughing. When Dr. Berry saw the patient he recognised an ovarian cyst which had been extruded through a rent in the vagina. The pedicle was transfixed and the tumour cut away. The woman recovered. The tumour is preserved in the museum of St. Bartholomew's Hospital. Kerswill * recorded a somewhat similar case. A woman in labour was found to have an obstruction in the pelvis; in the course of delivery an ovarian tumour the size of a cocoanut was detached and forced through a rent in the vagina. Five centimetres of the pedicle remained on the tumour. The woman recovered.

In a case recorded by Brewer,† in which an ovarian cyst obstructed delivery, the cyst ruptured from pressure, and the contents escaped through a rent in the vagina. The woman recovered.

Griffith ‡ has described a very exceptional case, in which a large fibroma of the ovary obstructed delivery. Craniotomy was performed, but it was necessary to turn the child; even then its transit was difficult. The mother died.

(*d*) **Extrusion of the Tumour through the Anus.**—This, happily, is a very rare complication of labour. Alexsenko § has reported a case in which an ovarian dermoid was, during labour, so pressed into the rectum that the wall of the bowel became invaginated, and the tumour invested by the bowel extruded through the anus. The mucous membrane was incised, the pedicle transfixed, tied, and the tumour removed. The ampulla of the tube was connected with the dermoid, and ovarian follicles were demonstrated on its walls. The woman recovered.

Stocks || reported a similar example, which occurred independently of pregnancy. A cyst invaginated the anterior wall of the rectum. The mucous membrane was incised, and

* *Brit. Med. Journal*, 1880, vol. ii. p. 83.

† Trans. Obstet. Soc., vol. xx. p. 184.

‡ *Ibid.*, vol. xxxiii. p. 140.

§ *Zeitsch. f. Geb.*, 1889, No. 10.

|| *Brit. Med. Journal*, 1875, vol. ii.

the tumour removed. It was a unilocular cyst weighing 175 grammes; the ovary and part of the Fallopian tube were attached. It was therefore a parovarian cyst. The woman recovered.

A woman may have a dermoid in her pelvis and delivery be possible, but the fœtus dies. The tumour represented in Fig. 102, page 229, I removed in 1892 from a young woman who had on two occasions been delivered of dead fœtuses by turning after excessively long labours. In each instance her life was despaired of, and her upgetting prolonged. Since the removal of the tumour she has had a rapid and easy labour.

II. **The Tumour is above the Uterus.** — In this set of cases there is rarely impediment to delivery; indeed, it may be said that *an ovarian tumour in the pelvis exercises baleful effects on the uterus and its occupant*, whereas in the case of an ovarian tumour lying high in the abdomen the reverse conditions pertain, for *delivery exercises a baleful influence on the tumour.*

The pressure to which the tumour is subjected leads to its **rupture,** or the alteration in position due to the emptying of the uterus is very liable to produce **axial rotation** and acute torsion of the pedicle (accidents the nature and consequences of which were fully discussed in chapter xvi.), and in a certain proportion of cases **suppuration** of the cyst ensues. These accidents complicate the **puerperium** far more than many obstetricians are willing to admit. To see that the dangers are real, the student need only glance at the list of cases in the tables E, G, and K.

Ovariotomy during Pregnancy.—Although ovariotomy had been successfully performed during pregnancy by Burd * of Shrewsbury in 1847, W. L. Atlee in 1850, and Marion Sims, the procedure did not meet with favour until it was forced upon the profession by Sir Spencer Wells † in 1877. This surgeon, in 1870, had pointed out its justifiability; but seven years later he strengthened his argument by reporting nine cases of ovariotomy during pregnancy with one death.

* Medico-Chir. Trans., vol. xxx. p. 95, and vol. xxxii. p. 64.

† Trans. Obstet. Soc., vols. xi. and xix.

The discussion which followed the reading of the paper is well worth perusal, as indicating the opinions regarding this grave complication and its treatment held by the leading obstetricians of that period. A very large number of cases have since been recorded, which are not only interesting as indicating surgical enterprise and boldness, but as serving to emphasise the remarkable tolerance of injury exhibited by the pregnant uterus, a fact which has long been traditional.*

It would be suspected that the risks of ovariotomy during pregnancy would at least be those of an ordinary ovariotomy *plus* the chance of abortion, but an analysis of a large number of cases demonstrates that when ovariotomy is performed before the fourth month of gestation the risk of abortion is very small, whereas the average mortality is less than in ovariotomy performed on non-gravid women (tables E, F, G, K). I have performed ovariotomy for a pelvic dermoid as late as eight and a half months, saving mother and child.†

The risks even of double ovariotomy during pregnancy, when the operation is undertaken before the fourth month, are very small, and the chances of interference with pregnancy are few, as the evidence displayed in table F demonstrates.

A study of recorded cases makes it very clear that in many instances ovariotomy has been undertaken in ignorance of the co-existence of pregnancy. In these circumstances, the gravid uterus has been stabbed with the trocar in mistake for a cyst. (*See* table H.) Even in such desperate circumstance the outcome has been occasionally a happy one.

The results of the operative treatment of ovarian tumours during pregnancy may be expressed thus:—

(1) Before the fourth month of pregnancy, single and double ovariotomy is attended with an exceedingly low rate of mortality, and the risk of disturbing the pregnancy is very small.

(2) The removal of a parovarian cyst during early pregnancy is more liable to disturb the uterus than simple or double ovariotomy.

* R. P. Harris, "Abdominal and Uterine Tolerance in Pregnant Women," Philadelphia, 1892.

† *Brit. Med. Journal*, 1895, vol. i. p. 461.

(3) After the fourth month the risk is that of an ordinary ovariotomy, but the chance of abortion increases with each month.

(4) When an ovarian tumour is discovered during labour and it impedes delivery, ovariotomy should be performed. If the tumour offer no obstacle to the passage of the fœtus, it should not be interfered with until after the puerperium.

(5) When a puerperal woman known to possess an ovarian tumour exhibits unfavourable symptoms, **ovariotomy should be resorted to without delay.**

The records for the tables E to K were selected from widely different sources, in order to demonstrate not merely that the practice of ovariotomy had spread over the whole civilised world, but also as indicating the success which attends this operation in what were formerly considered prohibitive conditions even in the hands of very experienced surgeons. Apart from the high success of ovariotomy in England, Australia, America, France, Germany, Russia, and other European countries, references have been made in this section to successful cases in China; and two Japanese surgeons, Omori and Ikeda, have published long lists of ovariotomies performed at Fu-kuo-ka with very encouraging results.

The extraordinary history of ovariotomy is well summarised by Pozzi when he writes that the operation passed through "a groping stage, then a stage of extreme specialisation, followed by one of broad generalisation."

In order to appreciate the difficulties experienced by the early ovariotomists the student should read the following works :—

1. Spencer Wells : *Diseases of the Ovaries*, London, 1872.
2. Lawson Tait : *Diseases of the Ovaries*, Birmingham, 1883.
3. Peaslee : *Ovarian Tumours*. New York, 1873.
4. Olshausen : *Krankheiten der Ovarien*, 1877 ; Pitha und Billroth's *Handbuch*, Bd. iv. heft 6.

TABLE E.

OVARIOTOMY (UNILATERAL) DURING THE EARLY MONTHS OF PREGNANCY.

REPORTER.	MONTH OF PREGNANCY.	COMPLICATIONS.	RESULT TO MOTHER AND EFFECT ON THE UTERUS.		REFERENCE.
Spencer Wells .	3rd	Ruptured	R.	Term	Trans. Obstet. Soc., vol. xi.
Spencer Wells .	3rd	—	R.	Term	Trans. Obstet. Soc., vol. xiii.
Spencer Wells .	3rd	—	R.	Term	"Diseases of Ovaries."
Spencer Wells .	4th	—	R.	Term	*Ibid.*
Spencer Wells .	4th	—	R.	Term	Trans. Obstet. Soc., vol. xix. p. 185.
Spencer Wells .	4th	Mult. cyst	R.	Term	*Ibid.*
Spencer Wells .	3rd	Mult. cyst	R.	Abort.	"Abdominal Tumours," 1885.
W. L. Atlee* .	2nd	Mult. cyst	R.	Term	"Ovarian Tumours" (1873), p. 237.
Wilson* . .	4th	Twist. ped.	R.	Term	*American Journ. of Obstet.* xiii. p. 308.
Kreutzmann* .	2nd	Cyst	R.	Term	*Ibid.*, vol. xxvi. p. 204.
Engstrom †. .	2nd	Twist. ped.	R.	Term	*Annales de Gyn.*, t. xxxiv. p. 357
Engstrom .	3rd	Dermoid	R.	Term	*Ibid.*
Engstrom . .	4th	Twist. ped.	R.	Term	*Ibid.*
Engstrom . .	4th	Dermoid	R.	Term	*Ibid.*
Omori and Ikeda‡	3rd	Cyst	R.	Abort.	*Berl. klin. Woch.*, 1890, No. 7.
Omori and Ikeda	4th	Dermoid	R.	Term	*Ibid.*
Omori and Ikeda	4th	Cyst	R.	Term	*Ibid.*
Omori and Ikeda	3rd	Cyst	R.	Term	*Centralbl. für Gyn.*, bd. xvi. p. 1009.
Omori and Ikeda	3rd	Cyst	R.	Term	*Ibid.*

* America. † Helsingfors. ‡ Japan.

TABLE F.

Double Ovariotomy during Pregnancy.

Reporter.	Month of Pregnancy.	Nature of Tumours.	Result and Effect on Pregnancy.		Reference.
Thornton . .	4th	Dermoid	R.	Preg. contd. to 8th mth.	Trans. Obstet. Soc. Lond., vol. xxviii. p. 41.
Mundé . .	5th	Dermoid	R.	Miscarried in 72 hrs.	*American Journ. of Obstet.*, xx. p. 730.
Potter . .	4th	Not given	R.	Term	*Ibid.*, vol. xxi. p. 1028.
Bantock . .	3rd	Dermoid	R.	Preg. ended at 7th mth.	*Journ. Brit. Gyn. Soc.*, vol. vi. p. 4.
Meredith . .	3rd	Papillomatous cysts	R.	Term	Trans. Obstet. Soc., vol. xxxii. p. 374.
Meredith . .	3rd	Dermoid	R.	*Ibid.*	*Ibid.*, vol. xxxiv. p. 239.
Polaillon . .	3rd	Cysts	R.	*Ibid.*	*Bull. de l'Acad. Méd.*, No. 30.
Cotterell . .	4th	Cysts	D.	—	*Lancet*, 1892, vol. ii.
Stratz. . .	3rd	Cysts	R.	No record	*Zeit. für Geb. u. Gyn.*, bd. xii.
Flaischlen . .	3rd	Dermoid	R.	Term	*Cent. für Gyn.*, No. 14, p. 309.
Veit . . .	2nd	Cysts	R.	Term	*Zeit. für Geb. u. Gyn.*, bd. xii. p. 450.
Lotheisen . .	—	—	R.	Term	*Med. Week*, 1894, vol. ii. p. 597.
R. Morison. .	$3\frac{1}{2}$	Dermoid	R.	Term	*Journ. Brit. Gyn. Soc.*, 1895.
Morris . .	3rd	Dermoid	D.	—	Middlesex Hospital Rep., 1887, p. 213.
Lebedeff . .	—	Dermoid	R.	No record	*Rep. Univ. d'Obstet.*, t. ix. p. 223.

TABLE G.

OVARIOTOMY (UNILATERAL) DURING THE LATE STAGES OF PREGNANCY.

REPORTER.	MONTH OF PREGNANCY.	COMPLICATIONS.	RESULT TO MOTHER AND EFFECT ON THE UTERUS.		REFERENCE.
Spencer Wells .	6th	Rupture	D.	Abort. in 6 hrs.	Trans. Obstet. Soc., vol. xix. p. 195.
Spencer Wells .	7th	Twist. ped.	R.	Abort. in 12 hrs.	*Ibid.*
Spencer Wells .	7th	Dermoid	R.	Labour in 25 days	*Ibid.*
Thornton . .	5th	Twist. ped.	R.	Term	*Int. Journ. Med. Sci.*, vol. cxvi. p. 363.
Thornton . .	7th	Twist. ped.	R.	Abort. in 50 hrs.	*Ibid.*
Galabin . .	6th	Cyst	R.	Term	*Brit. Med. Journ.*, 1880, vol. i. p. 397.
Bantock . .	7th	Mult.	R.	Term	*Brit. Med. Journ.*, 1888, vol. i. p. 296.
May . . .	8th	Cyst	R.	Abort. in 12 hrs.	*Brit. Med. Journ.*, 1893, vol. ii. p. 1210.
Engstrom . .	6th	Mult.	R.	Term	*Annales de Gyn.*, t. xxxiv. p. 357.
Engstrom . .	7th	Cyst	R.	Term	*Ibid.*
Mundé . .	5th	—	R.	Term	*N. York Med. Journ.*, Aug. 6th, 1887.
Halliday Croom .	6th	Mult.	—	Abort. in 2 days	Obstet. Trans. Ed., xix. p. 170.
Author . .	8½	Dermoid	R.	Anuria 50 hrs. Labour induced; living child	*Brit. Med. Journ.*, 1895, vol. i. p. 461.
Pippingsköld .	9th	Mult. cyst.	R.	Labour in 12 hrs.	*Am. Journ. Obstet.*, vol. xiii. p. 308.
Omori and Ikeda	5th	Cyst	R.	Term	*Centralbl. für Gyn.*, bd. xvi. p. 1009.
Omori and Ikeda	5th	Cyst	D.	Term	*Ibid.*
Omori and Ikeda	8th	Dermoid	R.	Term	*Berl. klin. Woch.*, 1890, No. 7.

TABLE H.

Ovariotomy during Pregnancy.

Injury to Uterus during Operation and the Mode of Treatment.

REPORTER.	MONTH OF PREGNANCY.	NATURE OF ACCIDENT AND TREATMENT.	RESULT.	REFERENCE.
Spencer Wells	5th	Uterus punctured. Cæsarean section	R.	*Med. Times and Gaz.*, 1865.
Pollock	5th	Uterus punctured in mistake for a second cyst. Uterine wound closed with silver wire. Abortion.	D.	*Lancet*, 1862, vol. ii. p. 257.
Erskine Mason	—	Same accident; same treatment; same result as case 2.	D.	*American Journ. of Obstetrics*, vol. xii. p. 13.
Byford	7th	Uterus punctured. Cæsarean section	R.	*Ibid.*
Hillas	—	Cut the uterus in opening belly. Cæsarean section	R.	*Aust. Med. Journ.*, 1875, p. 33.
Fortescue	—	Uterus punctured in mistake for cyst. Porro.	R.	*Aust. Med. Gaz.*, 1884.
Lee	—	Uterus punctured. Wound sutured with silk. Abortion 6 weeks later	R.	*American Journ. of Obstetrics*, vol. xvi. pp. 286 and 942.
Chiara	7th	Uterus punctured. Wound closed with sutures. Double Ov. Torsion of right cyst. Abortion.	R.	Dsirne: *Arch. für Gyn.*, bd. xlii.

Abstracts of these cases are given in chapter lii.

TABLE K.

OVARIOTOMY DURING THE PUERPERIUM, OR SHORTLY AFTER ABORTION.

REPORTER.	AFTER DELIVERY.	CONDITION OF TUMOUR.	RESULT.	REFERENCE.
Gooding . .	5th wk.	Suppurating cyst	D.	*Lancet*, 1873, vol. ii. p. 493.
J. Williams .	Labour	—	R.	Trans. Obstet. Soc., vol. xxvi. p. 203.
J. Williams .	31 days (abortion)	Suppurating cyst	R.	*Brit. Med. Journ.*, 1880, vol. ii. p. 973.
Veit . .	4 days	Torsion	D.	*Zeitsch. für Geb.*, bd. ix. p. 229.
Sippel . .	2nd wk.	Torsion	R.	*Centralbl. für Gyn.*, 1888.
Sells . .	4th wk. (abortion)	—	R.	*Brit. Med. Journ.*, 1883, vol. ii. p. 1016.
Aust. Lawrence *	4th wk.	Torsion	R.	*Brit. Med. Journ.*, 1893, vol. ii. p. 622.
Aust. Lawrence	6th wk.	Rupture	R.	*Ibid.*
Aust. Lawrence	5th wk.	Torsion	R.	*Ibid.*
Aust. Lawrence	Uncertain (abortion)	Torsion. Double ovariotomy	R.	*Ibid.*
Aust. Lawrence	4th wk.	Torsion	R.	*Ibid.*
Mundé . .	5th wk.	—	R.	*New York Med. Journ.*, Aug. 6th, 1867.
Mayo Robson .	5th wk.	Dermoid. Torsion	R.	*Brit. Med. Journ.*, 1893, vol. ii. p. 1426.
Butler Smythe	5th wk. (abortion)	Two dermoids	R.	*Brit. Med. Journ.*, 1893, vol. i. p. 890.
Hunter . .	4th wk.	Very large cyst	R.	*American Journ. Obstet.*, vol. xviii. p. 755.
Chambers .	10 days (abortion)	Suppurating cyst	D.	Trans. Obstet. Soc., vol. xix. p. 196.

* This operator also mentioned five other similar successful cases, but details were not recorded.

Part II.

DISEASES OF THE FALLOPIAN TUBES.

CHAPTER XXIII.

THE FALLOPIAN TUBES.

In every female mammal above Monotremata there is a section of the genital tract intervening between each abdominal ostium and the uterus in which, under normal conditions, fertilised ova (oösperms) are not retained. These narrow portions are the Fallopian tubes, and they serve to conduct the eggs from the ovaries to the uterus.

Each tube is continuous with the superior angle of the uterus, posterior to the point of attachment of the round ligament. When the tubes are straightened, each presents a wide outer end, then gradually narrows to its point of connection with the uterus; the expanded outer end is the **infundibulum**. The average length of each tube is 10 cm.; not infrequently one tube is longer than its fellow: the difference in length sometimes amounts to 1 cm. The inner or uterine third of the tube—the isthmus—is narrower than the outer two-thirds, and is sometimes tortuous, and varies in thickness from 2 to 4 mm. The outer segment, or ampulla, near the ostium, varies in width from 7 to 10 mm. The thickness of the walls of the tube varies inversely with the size of its lumen.

Each tube occupies the free border of the mesosalpinx; the **isthmus** is directed outwards and slightly upwards, but the **ampulla** descends, passes behind and external to the ovary, then turns its ostium upwards, so that the fimbriæ are in immediate contact with this gland (Fig. 1).

The tube is mainly composed of unstriped muscle fibre, continuous with that of the uterus, and arranged in an outer longitudinal and an inner circular layer. Loose connective

tissue intervenes between the muscular layer and the peritoneum, which invests it on two-thirds of its circumference. The lumen of the tube is lined with mucous membrane, covered with columnar ciliated epithelium. On slitting open the tube, the mucous membrane will be found disposed in longitudinal folds, or plicæ; when traced outwards, they will be found to increase in thickness on approaching the end of the tube, and at the ostium they dichotomise and become continuous with the fimbriæ which constitute so conspicuous a feature of this end of the tube.

The Abdominal Ostium.—No part of the Fallopian tube is so variable in form as this. Morphologically, it represents the anterior end of Müller's duct. According to our present knowledge, the duct is at first closed anteriorly, but at an early date it undergoes cleavage to form the ostium, and communicate with the cœlom (peritoneal cavity). Running from the ovarian border of the ostium to the ovary, and occupying the intervening free border of the mesosalpinx, there is a structure known as the *tubo-ovarian ligament*, traversed by a longitudinal furrow which causes it to resemble a long narrow leaf. This represents that portion of Müller's duct opened out along the line of cleavage. Frequently it is fringed laterally with small fimbriæ, sometimes continuous with, but often distinct from, the plicæ in the tube. The fimbriæ around the ostium have been carefully investigated by Richard.* He demonstrated them to be continuous with the folds of mucous membrane within the tube.

Doran† has studied them, and points out that "careful examination of the grooves between the plicæ will enable the observer to trace the particular intra-tubal plica to which each fimbria belongs. There is another order, so to speak, of secondary plicæ, which spring from the sides of the primary plicæ forming the fimbriæ. They give rise to the arborescent appearance seen in microscopic sections of the tube at the ostium. On the other hand, the two divisions of a primary fimbria may join again, as is often seen, above the ostium, within the canal."

* "Thèse Anatomie des Trompes de l'Utérus chez la Femme," 1851.

† Trans. Obstet. Soc. London, vol. xxvi. p. 344, 1889.

As the fimbriæ represent luxurious folds of mucous membrane projecting beyond the tube, we must study the boundary line, where they bulge beyond the serous membrane. When the peritoneum is traced along the tube to the ostium it will be found to terminate suddenly and form a sharp line. Occasionally, however, the peritoneum extends for a variable distance on the fimbriæ. The sudden termination of the peritoneum on the tube occasionally produces a circular constriction, and indicates the spot where the circular muscle fibres of the tube terminate; the fringed portion of the tube beyond is the *infundibulum.*

The ostium varies much in shape and size, as well as in the number and degree of development of the fimbriæ not only around it, but along the tubo-ovarian ligament.

Hyrtl, in his classical *Lehrbuch der Anatomie*, writes:— "The fimbriæ at the abdominal ostium appear as if they were bitten or torn away; hence the term *morsus diaboli.* The devil has since Eve's time had more to do with womenkind than with men." Der Schwabenspiegel (1273) says: "*Mulier est malleus, per quem diabolus mollit et malleat universum mundum.*" The term *morsus diaboli* is borrowed from botany. The plant *Scabiosa succisa,* formerly much used owing to its healing properties, was called "devil's-bit scaby," because its root presents a premorse, or bitten-off, appearance. The virtues of this plant to suffering humanity rendered it an object of dislike to the devil, and the superstitious old herbalists believed that in his wrath he bit off the root. There is, however, little resemblance between the *root* of the plant and the fringed ostium of the Fallopian tube, but Doran has pointed out the striking resemblance which exists between it and the *flower* of the devil's-bit scaby.

Accessory Ostia and Tufts of Fimbriæ.—The first systematic description of accessory ostia to the Fallopian tubes we owe to Richard.* He found five examples in thirty females. Two of the specimens had two accessory ostia in one tube; one of these was from a fœtus at term. The figure illustrating this is reproduced by Farre in his classical article "Uterus," in Todd's "Cyclopædia." Since Richard drew

* "Pavillons Multiples Recontrés sur des Trompes Utérines," *Gaz. Méd. de Paris,* 1851.

attention to the malformation, several observers have recorded cases. The best account is furnished by Doran,* who, in the course of an examination of 1,000 uterine appendages between 1878 and 1886, met with only five examples of malformed tubes.

In the specimens examined by Richard the accessory ostia communicated with the interior of the tube, but Doran has shown that accessory fimbriæ may be present unassociated with an abnormal orifice in the tube; further, an accessory ostium surrounded by fimbriæ, and a pedunculated tuft of fimbriæ unconnected with an accessory opening, may occur on the same tube. Two accessory ostia may exist in one tube (Fig. 81, B).

Pedunculated accessory fimbriæ (Fig. 81, A) are probably derived from Kobelt's tubes. When describing the parovarium, attention was drawn to the pedunculated cysts so frequently found at its outer end, known as Kobelt's tubes. Some of these small cysts rupture, and instead of a stalked cyst we find a pedunculated tuft of fimbriæ. The cysts sometimes appear as if growing from the wall of the tube, and I have little doubt that the stalked tufts of accessory fimbriæ originate in similarly displaced Kobelt's tubes. A specimen which supports this view is sketched in Fig. 81, C. A small cyst, furnished with a small tuft of fimbriæ, lies on the tube in such a manner that it seems to grow from the tube, but the pedicle could be easily traced under the peritoneum until it was lost in the parovarium.

The Hydatid, or Cyst of Morgagni.—This term is applied to a small stalked cyst, attached to the fimbriæ, and in some instances to the tube itself. It is rarely larger than a pea. Sometimes it is represented by a tuft of fimbriæ supported on a long pedicle. Occasionally the pedicle of the cyst is furnished with a small tuft of fimbriæ. The true hydatid must not be confounded with stalked cysts so frequently found associated with the parovarium. Ballantyne† and Williams have carefully investigated the frequency with which the true "hydatid" is present. They found stalked

* "Malformation of the Fallopian Tube," Transactions of the Obstetrical Society, London, vol. xxviii. p. 171.

† *Brit. Med. Journal*, Jan. 24, 1891.

cysts present in 75 per cent. of specimens examined. The true Morgagnian cyst was present in 8 per cent. in adults,

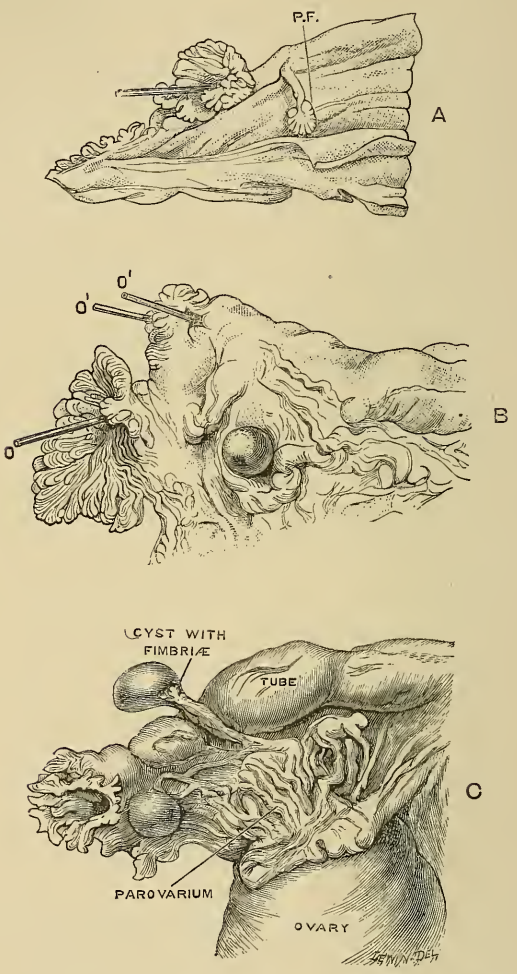

Fig. 81.—A, Pedunculated Accessory Fimbriæ. B, Two Accessory Ostia on one Fallopian Tube. C, Pedunculated Cyst from the Parovarium, lying athwart the Tube ; it possesses a tiny tuft of fimbriæ.

P.F., Pedunculated tuft of fimbriæ ; O, normal ostium ; O' O', accessory ostia.

and in 27 per cent. of fœtuses and infants. The total number of tubes examined was ninety-four pairs from adults, eleven pairs from fœtuses, and five pairs from children. There

are structural differences between the two forms. According to Ballantyne and Williams, the true Morgagnian cyst "is lined by a mucosa with simple folds, covered by a single layer of ciliated columnar epithelial cells; its wall is always composed of muscular fibres, arranged circularly and longitudinally; its outer membrane is the peritoneum; its stalk is always muscular, and its contents consist of clear limpid fluid;" whereas the small pedunculated cysts of the parovarium have fibrous stalks and walls; the inner walls of such cysts are lined by cubical epithelium.

The Mucous Membrane of the Fallopian Tube.—The

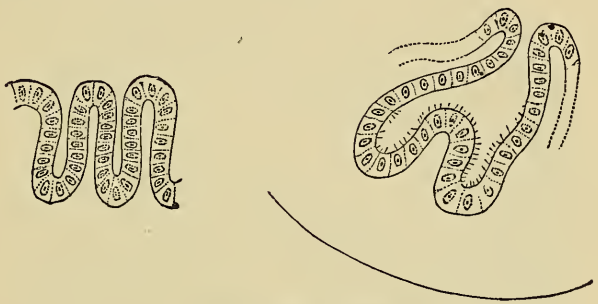

Fig. 82.—Simple Glands.

tubal mucous membrane is thrown into longitudinal folds, or plicæ, which are most numerous in the wide portion of the tube. In the isthmus they are small in size and few in number, and at the inner orifice the mucous membrane is continuous with that lining the uterus. The epithelium is columnar in shape, and furnished with delicate cilia. It is usually stated that the tube is devoid of glands, but how far this statement represents the actual state of affairs is well open to question. The structure of the mucous membrane of this tube has been so carefully and systematically examined by competent observers that the mere facts are beyond dispute, but they will admit of a different interpretation from that usually placed upon them, and arguments and facts will now be advanced in order to show that the folds in the tubal mucous membrane are glands.

A gland in its simplest form is a sac or tube derived from

the invagination of epithelium. Larger and more complicated glands may be derived from this as the result of secondary outgrowths from the primary sac (Fig. 82).

The glandular nature of the recesses in the human Fallopian tube could not be settled without an appeal to the characters of the mucous membrane in the Fallopian tube of other mammals, and the corresponding section of

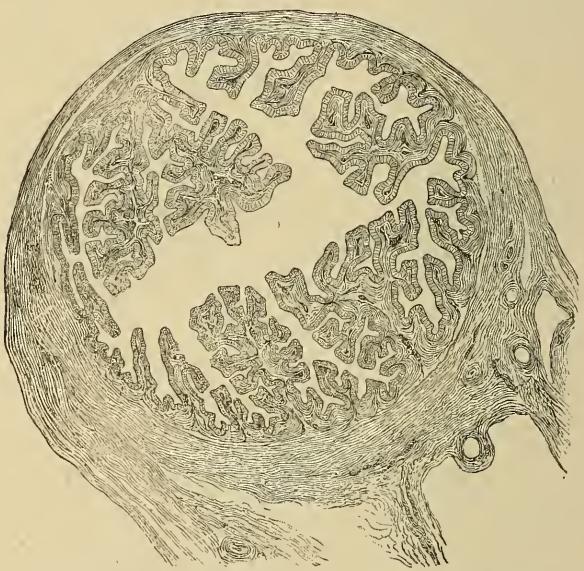

Fig. 83.—Transverse Section of the Fallopian Tube of a Macaque Monkey (*Macacus rhesus*).

the oviducts in lower vertebrata. Take, for instance, the elaborate work required of the mucous membrane in a bird's oviduct, not only for producing an albuminous investment for the egg, but the subsequent deposition of a calcareous coat exhibiting a definite structure. Yet the mucous membrane is simply thrown into longitudinal folds resembling the so-called rugæ or plicæ of the human Fallopian tube.

The simple construction of the mucous membrane in

the avian oviduct is well calculated to excite astonishment when compared with the lining of the oviducts of frogs, salamanders, lizards, and tortoises. In these animals the

Fig. 84.—Recess of the Tubal Mucous Membrane of a Deer (*Cervus eldi*).

mucous membrane of the oviducts is richly beset with complex glands.

In many mammals the mucous membrane of the tubes is far more complex than in the human female. The microscopic appearance of a transverse section of the tube from a Macaque (*Macacus rhesus*), taken from near the middle of the tube, is represented in Fig. 83.

It shows very well the cluster-like arrangement of the glandular acini, each presenting a single layer of large regular sub-columnar epithelium. An examination of a large number of specimens shows that in the middle of the tube the mucous membrane is most complicated; in the section near the uterus it is simplest, and the number of acini, or recesses, varies with age.

The Fallopian tubes of ruminants are very thin, narrow ducts, but the mucous membrane reaches a high degree of

Fig. 85.—Transverse Section of the Fallopian Tube of a Woman. (After *Schenck*.)

complexity, and is richly beset with glands of a racemose type. A sketch of a recess from the tube of the deer (*Cervus eldi*) is given in Fig. 84. The recesses are lined with a single layer of regular columnar epithelium; they are so numerous that as many as twelve may be counted in one section of a tube. Mucous membrane as complex as this occupies the Fallopian tube of the Malay bear.

A very instructive sketch of the tubal mucous membrane of a woman is reproduced in Fig. 85. The most instructive age at which to observe the Fallopian glands is in the tubes of the fœtus at birth. At this date they attain their greatest complexity, and specimens even more luxuriant than those

of the Macaque are not infrequently found. The probable function of the Fallopian glands is to provide an albuminous fluid for the ovum as it traverses the Fallopian tube.

It is well to emphasise the point that the microscopical characters of the tubal mucous membrane do not admit of any difference of opinion. The question is one of interpretation.

CHAPTER XXIV.

SALPINGITIS AND ITS IMMEDIATE EFFECTS.

SALPINGITIS, or inflammation of the Fallopian tube, is nearly always secondary to septic infection of the genital tract.

Causes.—The chief are septic endometritis, gonorrhœa, and cancer of the uterus; exceptional causes are tubercle and actinomycosis.

The changes in the tubes, induced by septic endometritis and gonorrhœa, are nearly identical. We must now proceed to consider them. When inflammation extends from the vagina into the uterus, and passes into the tubes, the tubal tissues become soft, succulent, swollen, and friable. The fimbriæ are also swollen and succulent. When the tube is slit up, the mucous membrane will be found covered with glutinous pus. If the tube be gently squeezed before it is opened, a few drops of pus will exude from the ostium.

Occlusion of the Abdominal Ostium.—This is an event of great importance, and one that requires careful consideration. Doran* has clearly shown that the ostium may be occluded by perimetritis or salpingitis.

Perimetric Closure.—Perimetritis indicates inflammation of the pelvic peritoneum in the immediate neighbourhood of the uterus and mesometrium. It may be secondary to salpingitis, endometritis, uterine cancer, or tumours of the pelvic viscera. One of its most constant effects is the formation of adhesions, due to organisation of inflammatory products, in the neighbourhood of the abdominal ostium of the tube. The method by which the tube is closed in perimetritis is very simple. Inflammatory matters effused among and in the tissues of the fimbriæ cause them to swell and adhere together, often to the ovary. The effused material organises and binds the agglutinated fimbriæ to adjacent

* "On Closure of the Ostium in Inflammation and Allied Diseases of the Fallopian Tubes," Trans. Obstet. Soc., 1890.

structures, such as the ovary, mesometrium, pelvic peritoneum, uterus, or rectum, and mechanically seals the ostium.

Salpingitic Closure.—This is a slow but interesting process. It takes place in the following manner:—The Fallopian fimbriæ may be regarded as luxuriant protrusions of the mucous membrane beyond the ostium. When inflamed they enlarge greatly. As the inflammation extends into the

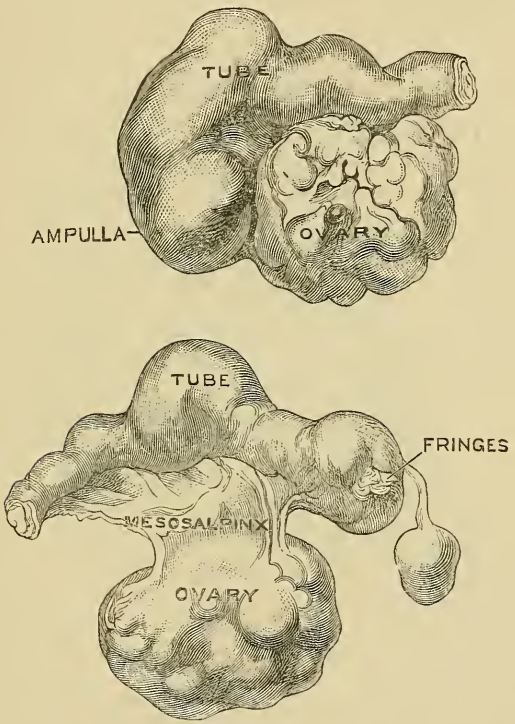

Fig. 86.—Examples of Fallopian Tubes occluded by Salpingitis. Natural size.

muscular coat of the tube it becomes lengthened, and gradually bulges over the fimbriæ, until the ostium presents a rounded orifice instead of its usual fringed appearance. Eventually these rounded margins contract, narrow the orifice, and cohere, giving it a smooth, rounded end (Fig. 86).

After closure of the ostium, pus or mucus will accumulate within the tube, for the inflamed mucous membrane obstructs the uterine orifice, and the intervening section will distend

into a legume-shaped cyst, called hydrosalpinx or pyosalpinx, according to the nature of the retained fluid. Doran has pointed out—and my own observations are in complete harmony with his—that perimetritis, when secondary to salpingitis, will assist the latter in occluding the ostium. In many specimens of salpingitic occlusion of the tube a small pedunculated cyst is often present (Fig. 86).

Burrowing of the Tube.—Coincidently with occlusion of

Fig. 87.—Transverse Section of the Tube and Mesosalpinx, in which the latter is infiltrated with inflammatory products, secondary to gonorrhœal salpingitis.

the ostium, other changes are taking place. As the tube enlarges when inflamed, it spreads out the two layers of the mesosalpinx, and often burrows between them towards the ovary. As the tube thickens it also lengthens; but, being held by the tubo-ovarian fimbria and the mesosalpinx, it will often become markedly tortuous. The majority of salpingitic tubes burrow between the layers of the mesosalpinx until the ovary and tube are in contact. This process is called "obliteration of the mesosalpinx." It is occasionally prevented by the connective tissue between the tube becoming infiltrated with inflammatory products. In some cases the

tube and ovary are drawn together by adhesions, and on dividing these the tube and ovary are easily separable. In such examples the mesosalpinx is merely crumpled, not obliterated. These processes have an important relation to the formation of tubo-ovarian abscesses. Salpingitic occlusion of the ostium is a slow process, and this accounts for the frequent existence of perimetritis as a complication.

The Minute Changes in Infected Fallopian Tubes.—Before proceeding to discuss the gross changes which occur subsequent to closure of the abdominal ostium, it will be convenient to consider the minuter changes which characterise infective salpingitis. The most instructive specimens are obtained from patients in whom salpingitis is secondary to gonorrhœa, and who have exhibited evidence of tubal disease for many months. On dividing the ampulla of such a tube, it will be found greatly thickened in all its coats—serous, muscular, and mucous—especially the last, which will often present a closely plicate arrangement, resembling the arbor vitæ of the cerebellum. When slightly magnified the so-called plicæ of the tube are seen to be swollen, and almost fill the lumen of the tube, whilst the mesosalpinx is occupied by inflammatory exudation, in which the vessels are firmly embedded (Fig. 87).

Without assuming that it is proved that pus is always due to micro-organisms, there seems little room for doubt that gonorrhœa and septic endometritis are due to the presence of such bodies, and these two affections are the most frequent cause of salpingitis. When a healthy Fallopian tube is examined in transverse section by means of a microscope, we distinguish easily the serous and muscular coats of the tube, and, standing upon these, the so-called plicæ formed by the mucous coat. Each plica consists of a delicate framework of connective tissue, fringed with columnar ciliated epithelium on the free surface. Delicate strands of unstriated muscle cells may be distinguished near the base of the epithelium, and in the middle of the fold are many capillaries. As a rule, a few leucocytes may be seen scattered among the meshes of the connective tissue. When sections are prepared from tubes which have been for some months the seat of salpingitis, the appearances are very different. The plicæ are swollen

to twice or thrice the usual size, and all the details of their structure obscured by an innumerable host of cells of various sizes (Fig. 88). In many places the limiting epithelium is lost; in others it can be detected, disturbed and disarranged,

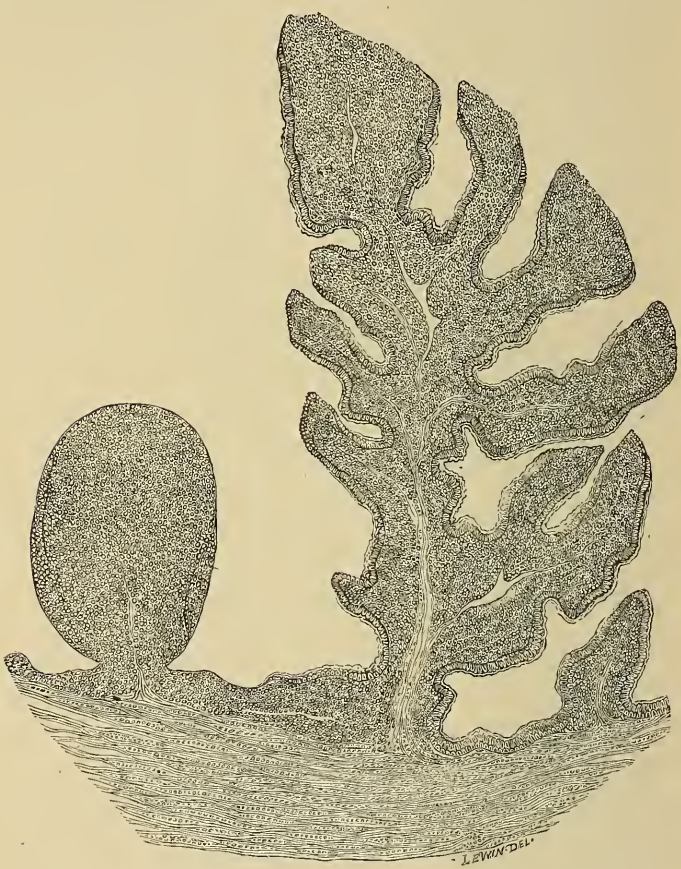

Fig. 88.—Plica of the Tubal Mucous Membrane, in section. Highly magnified. (From a case of gonorrhœal salpingitis.)
The epithelium persists in the recesses.

here and there seemingly held in position by some glutinous material. In mild cases this peculiar cell infiltration is limited, and does not involve the whole plica, but in very diseased specimens the cells are not limited to the plicæ, but

involve the muscular coat, and extend into the connective tissue of the mesosalpinx.

Oöphoritis Secondary to Infective Salpingitis.—When the inflammatory process extends to the peritoneum in chronic cases of salpingitis, it is sure to involve the ovary. The first effect is to cause thickening of its capsule, and if lymph is effused upon its surface, this may organise, and extensive perimetritic adhesions result. The effects of this thickening of the capsule are twofold. At first it prevents

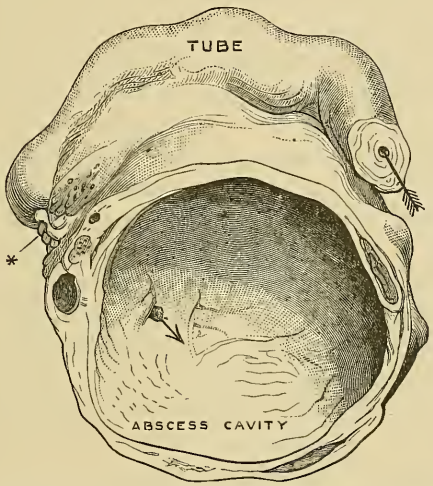

Fig. 89.—Tubo-Ovarian Abscess, secondary to Gonorrhœa.
* Adherent fimbriæ.

the rupture of ripe ovarian follicles, and the tension gives rise to considerable disturbance and causes pain; as the enlarged follicles discharge their contents with difficulty, it naturally follows that on section an ovary which has long been the seat of perioöphoritis will be found largely converted into cystic spaces, two or more of which may become confluent, and form a cyst the size of a walnut. As such a cyst enlarges and makes its way by absorption to the surface, it not infrequently comes into relation with, and adheres to, the dilated pus-containing ampulla of the corresponding tube, which has been brought in contact with it through the restraining influence of the tubo-ovarian ligament, or by direct adhesion, for the ovary and tube are in contact. Except that the tube and ovary

become bound together, no further change ensues in the majority of cases, but not infrequently absorption takes place, and the dilated ampulla of the tube will communicate with an enlarged follicle or cyst in the ovary, and thus give rise to a tubo-ovarian abscess. The communication in such cases is usually small, and barely admits a probe (Fig. 89).

Gonorrhœal Endometritis.—Although the most serious sequelæ of gonorrhœa in women are connected with the Fallopian tubes and ovaries, it is necessary to emphasise the fact that grave chronic changes also occur in connection with the uterus. Patients occasionally come under observation presenting typical symptoms of chronic gonorrhœal salpingitis, and on examination with the speculum an acrid purulent discharge is seen issuing from the uterus and excoriating the vagina. It might be supposed that this purulent material escapes from the Fallopian tubes into the cavity of the uterus were it not for the fact that the discharge sometimes continues after removal of the tubes and ovaries. My attention was first seriously directed to this matter in consequence of patients from whom I had removed pus-containing Fallopian tubes secondary to gonorrhœa, complaining of the inconvenience and suffering caused by the acrid discharge. In some of these cases I have found it necessary, after exhausting other means, to perform vaginal hysterectomy.

In one case in which this treatment was adopted in a young married woman who was infected on her marriage, the husband being at the time under treatment for gonorrhœa, the endometrium was submitted to microscopical examination: it presented characters very similar to the section of tubal mucous membrane represented in Fig. 88.

Sterility of Strumpets.—Many have asked the question, "How is it that strumpets are so often sterile?" It is said that the question was answered many years ago by Morgagni, who correctly associated it with occlusion of the tubes as a consequence of inflammation extending from the vagina. I have looked carefully through his "Letters," but have failed to find any direct statement on this matter. The sterility of strumpets has long been known; it is indicated in Hosea iv. 10. An inquiry into the history of prostitutes shows that many of them have fallen from virtue and given birth to a child before

they began a life of systematic prostitution. It is equally certain that many professed strumpets are permanently sterile because inflammatory affections, such as vaginitis or gonorrhœa, are soon communicated to them, and the tubes become sealed.

Very early in my pathological investigations I used to seize opportunities of conducting *post mortem* inspections in a parish mortuary, and satisfied myself that the explanation of the sterility of strumpets attributed to Morgagni is the correct one.

The Bacteriology of Salpingitis.—Investigations on the micro-organisms present in infected and pus-containing tubes have been carried out in many instances. In a large proportion of cases the fluids contained in chronically inflamed and dilated tubes were *sterile*. In a fair proportion the gonococcus was present, occasionally alone, but frequently associated with the streptococcus and the staphylococcus. More rarely the pneumococcus and the bacterium coli commune have been detected.

The characters of the micro-organisms in a distended Fallopian tube very largely influence the course of a case. For example, a pyosalpinx in which the pus is sterile or contains non-pathogenic organisms may leak into the belly and give rise to troubles merely local; but if it contain streptococci, staphylococci, or bacterium coli commune, the result would be fatal. The same applies to pus-contamination of the peritoneum in the course of oöphorectomy, etc.

Tubercular Salpingitis.—Most examples of this disease are undoubtedly secondary to tuberculosis of the endometrium. The naked-eye features of a tubercular tube are often very characteristic, but it is often impossible to distinguish it from a pyosalpinx. In many instances the abdominal ostium is occluded, and the tube tightly stuffed with caseous material (Fig. 90). On removing this material, the mucous membrane presents the usual velvet-like appearance, characteristic of the walls of a chronic abscess.

In many patients tubercular lesions are found in other parts of the body, so that it is difficult to decide which is the primary seat of the disease. The bacilli are often difficult of detection; however, when tubes are found distended with

caseous pus, and lesions containing tubercle bacilli are found in other organs, it may be used as evidence that the disease in the tubes is likewise tubercular. The only absolute test of tubercular salpingitis is the detection of the tubercle-bacilli in the contents or the tissues of the Fallopian tube.

The microscopical characters of tubercular salpingitis consist of inflammatory thickening of the serous covering and muscular coat of the tube. The enlargement of the muscular coat is often erroneously referred to as hypertrophy; it is due

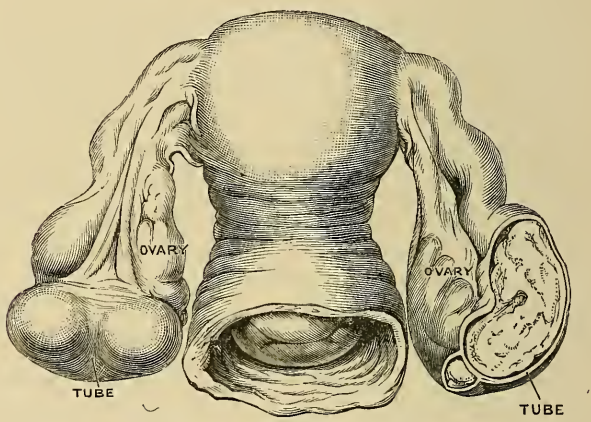

Fig. 90.—Tubercular Fallopian Tubes from a Child. Natural size.

to small round-celled infiltration. Here and there small nodules are seen surrounded by muscle tissue; such nodules present the characteristic histological structure of tubercle, and in favourable sections suitably prepared tubercle-bacilli may be detected. In most specimens the tubal mucous membrane is destroyed either by being infiltrated with inflammatory products or by ulceration.

It is an important clinical fact that many cases of tubercular peritonitis in girls and young women are due to infection from tubercular tubes, in which the ostium has remained open. Exceptionally, infection of the peritoneum has resulted from rupture of a tubercular tube. On the other hand, it is possible that the tubes have in some cases become infected secondarily to tuberculosis of the peritoneum.

Actinomycosis of the Fallopian Tube.—An example of

this has been recorded by Zemann* in a cook forty years of age. At the *post-mortem* examination the right tube was distended with pus, and its walls contained actinomycotic nodules. The tube was enlarged to the thickness of a finger, its walls were hard and adherent to the surrounding parts and to a coil of ileum. Secondary abscesses existed in the liver, lungs, and brain.

Zemann discusses the case very carefully; and it seems difficult to decide whether the tube became secondarily affected from the alimentary canal by means of the adherent loop of ileum, or was the primary seat of the disease, the actinomyces gaining access to the tube by way of the vagina. The evidence indicates that the vagina was most probably the channel by which the tube became affected.

Syphilis.—Gummata have been reported as affecting the Fallopian tubes. Bouchard and Lépine reported† a case in which the tubes were swollen to the dimensions of a finger, and contained three gummata the size of nuts.

Parasites. *Echinococcus Cysts.*—A primary echinococcus colony has not yet been recorded in the Fallopian tube. Moloney met with a case in which a tube communicated with an echinococcus cyst of the liver, and daughter vesicles were found in the tube. (*See* page 353.)

Ascaris lumbricoides.—Bizzozero reported a case in which in a woman thirty-four years old a round worm was found in the right Fallopian tube.‡

Foreign Bodies.—Minar§ records a case in which a crochet-hook 12 cm. long was found in a Fallopian tube.

* "Ueber Aktinomykose des Bauchfelles," Case iv.; *Medizinische Jahrbucher*, Wien, 1883, p. 477.

† *Gaz. Méd. de Paris*, 1866, No. 41; Boldt, *New York Med. Record*, 1887, vol. xxxii. p. 212.

‡ Martin, "Die Krankheiten der Eileiter," p. 93.

§ Michigan Med. Soc., Detroit, 1889, p. 305.

CHAPTER XXV.

SALPINGITIS (*continued*): ITS REMOTE EFFECTS; PYOSALPINX; TUBO-OVARIAN ABSCESS; HÆMATOSALPINX.

Pyosalpinx.—In severe cases of salpingitis after occlusion of the abdominal ostium, accompanied, as is usual, with obstruction of the uterine end of the tube, the pus is as securely locked up in the tube as it would be in a deep-seated abscess, and it follows the course of an abscess. The walls of the tube, stretched by the accumulating pus, gradually thin, and the inflamed tube becomes adherent to surrounding structures—ovary, uterus, rectum, intestine, or mesometrium. The wall of the tube continues to thin until, on some slight exertion, it bursts. If the pus be discharged into the peritoneal cavity (cœlom), it establishes rapidly fatal infective peritonitis. Left pyosalpinx is very prone to open into the rectum (Fig. 91). When a pyosalpinx contracts adhesions to bowel, the pus it contains becomes fœtid, due to leakage of intestinal contents.

The accumulation of pus in the Fallopian tubes leads sometimes to great distension, so that they become converted into legume-shaped cysts, measuring 16 cm. in length and 10 cm. in circumference. Such tubes will rise out of the pelvis, and form tumours reaching as high as the umbilicus. A large pyosalpinx has often been mistaken clinically for an ovarian cyst.

When examined microscopically, the true tissues of the tubes are found distended and thinned, except in places where they are infiltrated with inflammatory products.

Pyosalpinx in Uterine Cancer.—Distension of the Fallopian tubes not infrequently accompanies cancer of the uterus, and in a certain proportion of cases precipitates the final event by rupturing and producing peritonitis. To Dr. J. K. Fowler * we are indebted for this addition to our

* Medical Society's Proceedings, London, vol. vii. p. 441.

knowledge. In a "Contribution to the Pathology of Hydro- and Pyo-salpinx" he describes briefly fifteen examples which he met with in the course of three years in the *post-mortem* room of the Middlesex Hospital. Of these, pyosalpinx was associated with uterine cancer in two instances.

The records of the Middlesex Hospital, embodied in the Reports annually prepared by the pathologists who have

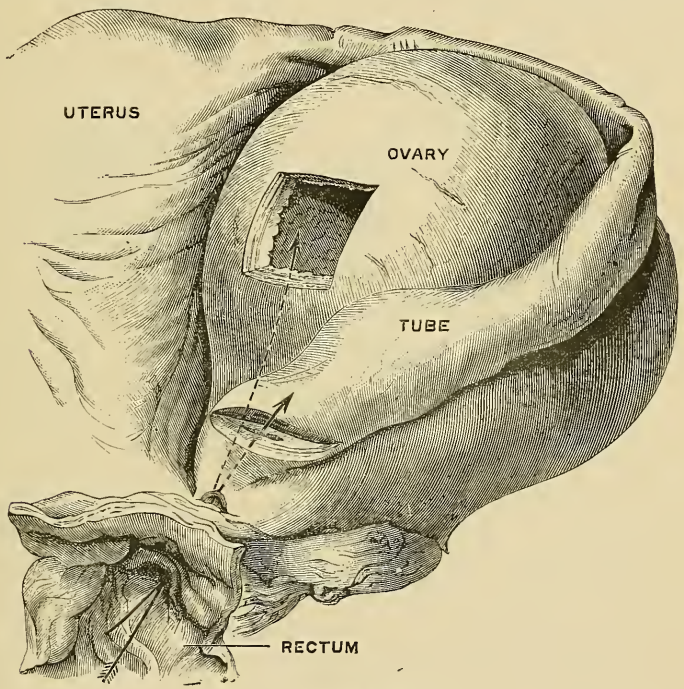

Fig. 91.—Large Pyosalpinx.
The tube communicates with an abscess in the ovary (tubo-ovarian abscess), and each communicates with the rectum.

succeeded Dr. Fowler, contain confirmatory observations, and indicate that pyo- and hydro-salpinx complicate uterine cancer in the proportion of not less than 10 per cent.

Tubo-ovarian Abscess.—On page 207 it was pointed out that when the infective process in salpingitis reaches the abdominal ostium of the tube, it extends to the peritoneum and implicates the ovary, frequently giving rise to a tubo-ovarian abscess. In this condition, as shown in Fig. 89, the

ovary is replaced by an abscess which communicates with a distended pus-containing tube. The orifice of communication is an adventitious opening, and does not represent the abdominal ostium of the tube.

In tubo-ovarian abscess the abdominal ostium of the tube is occluded, and its rounded head under these conditions is well shown on the left tube in Fig. 92. This fact indicates that the primary trouble was tubal.

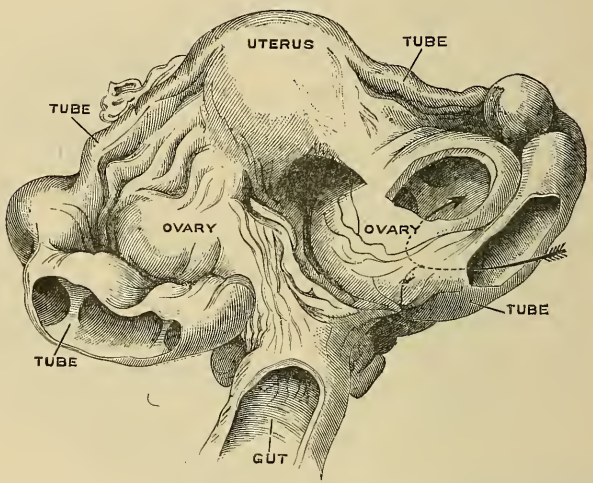

Fig. 92.—Uterus with the Tubes and Ovaries. The Left Tube is in the condition of Pyosalpinx; the Right Ovary and Tube are converted into a Tubo-ovarian Abscess. (Museum, Royal College of Surgeons.)

When a pyosalpinx or a tubo-ovarian abscess opens into the rectum, the pus is discharged through the anus at irregular intervals, and is accompanied by great improvement in the patient's symptoms. When a tubo-ovarian abscess communicates with the rectum, it is the portion of the abscess lodged in the ovary that usually becomes the seat of fistula.

Non-inflammatory Stenosis of the Tubal Ostium.—There is a curious and somewhat rare variety of tubal distension, which is sometimes, though erroneously, described as pyosalpinx; it is not caused by septic changes in the uterus or gonorrhœa. The patients are usually virgins; or if married, they are sterile.

In well-marked specimens the tubes become converted

into huge banana-like or legume-shaped cysts, which not only appear above the pelvic brim, but may reach as high as the navel. The abdominal ostium is usually completely occluded, but traces of the fimbriæ are generally observed even in extreme cases. The contents of these dilated tubes are viscid like old honey, and are occasionally of the consistence of putty. In some specimens the mucous membrane resembles chamois leather. This rare variety of tubal disease seldom causes inconvenience until the enlargement of the tubes produces obvious swelling of the lower part of the belly. The change probably depends on non-inflammatory (probably congenital) stenosis of the abdominal ostia of the Fallopian tubes.

Hæmatosalpinx.—Fallopian tubes are frequently found dilated, as in hydrosalpinx, but filled with blood-clot. This condition is *hæmatosalpinx*—a term often employed very loosely. Recent observations serve to show that those dilated tubes to which the term most strictly applies are, in very many instances, gravid.

Many museum specimens, supposed to be examples of hæmatosalpinx, are examples of very early tubal pregnancy. This question is fully discussed in the section devoted to tubal gestation. The term *hæmatosalpinx* should be exclusively reserved for Fallopian tubes in which the abdominal ostium is closed and the dilated portions occupied by clot, in which no evidence of pregnancy (such as an embryo, mole, or chorionic villi) is detected.

It must be remembered that neither a dilated tube filled with chocolate-coloured fluid, nor an undilated tube containing free blood, should be termed a hæmatosalpinx.

CHAPTER XXVI.

THE REMOTE EFFECTS OF SALPINGITIS (*concluded*).

HYDROSALPINX. SCLEROSIS OF THE TUBE.

Hydrosalpinx.—The persistent course of salpingitis leading to occlusion of the ostium, though very frequent, does not occur in all cases. Many mild attacks may be conveniently

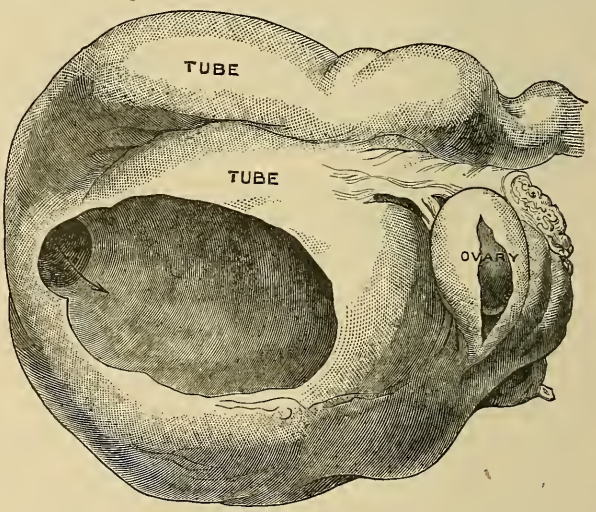

Fig. 93.—Hydrosalpinx.

described as "catarrh of the tube," and, like a nasal or gastric catarrh, subside and leave no trace. When the inflammation is sufficiently intense to seal the ostium, permanent damage results, and if, as is so commonly the case, both tubes are affected, they remain throughout life functionless, and often a source of grave danger. In cases of salpingitis sufficiently severe to occlude the ostium, the tube is, after the subsidence of the inflammation, in the condition of an obstructed gall-bladder; there being no escape for the fluid which is excreted by the glands in its walls, it consequently

forms a cyst by retention. The contained fluid is more or less colourless; sometimes it has a greenish tinge, due to the presence of cholesterine. Frequently it is the colour of chocolate. This condition is termed **hydrosalpinx**, and may be defined as *a Fallopian tube, distended with fluid in consequence of inflammatory occlusion of its abdominal ostium* (Fig. 93).

The changes arising in the occluded and distended tubes

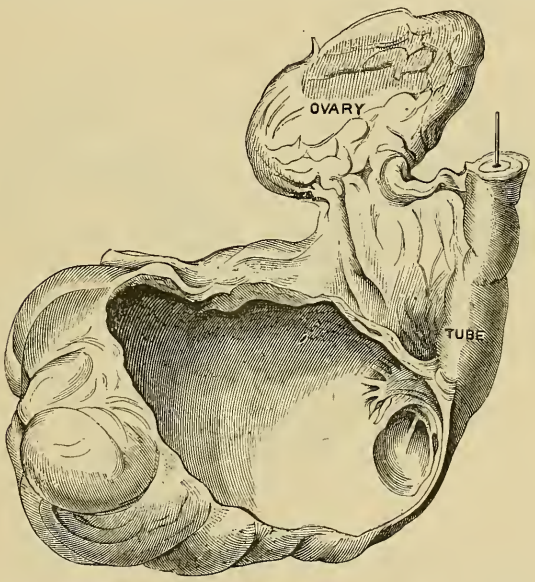

Fig. 94.—Hydrosalpinx. (Museum, St. Thomas's Hospital.)

are such as we are familiar with in the case of the gall-bladder, vermiform appendix, or pelvis of the kidney, when they become cysts by retention. The first effect of the accumulating fluid upon the walls of the tube is to stretch them; this continual pressure induces atrophy, the pathological sequence. The epithelium and mucous membrane become thin and atrophied until nothing but a thin-walled transparent cyst with delicate ridges remains, representing all that is left of the longitudinal plicæ of the tubal mucous membrane. The shape of a typical hydrosalpinx is very characteristic, and though not invariable, is fairly constant; it resembles a legume with somewhat blunt ends; the ovary always

occupies the concave border of the legume, and the bent shape of the cyst is doubtless due to the traction exercised by the tubo-ovarian fimbria or ligament. In some specimens the situation of the ostium is indicated by a depression, from which a series of folds radiate, as in Fig. 94, reminding us of the ridges and furrows on the face of a stump after a circular amputation through the thigh or arm. In hydrosalpinx the tubes rarely attain a large size. This is due to the fact that as the tube distends the mucous and muscular coats

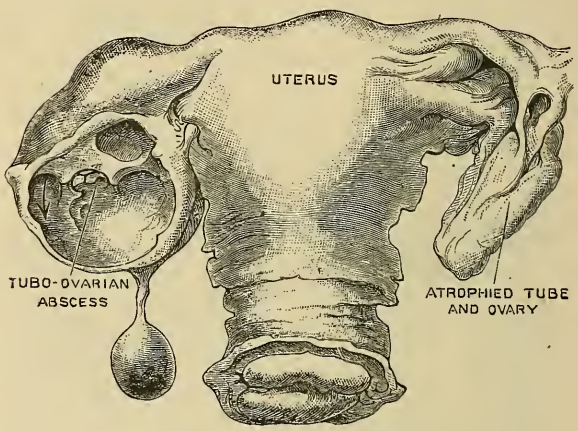

Fig. 95.—Uterus of a Harridan.

atrophy. The largest examples of hydrosalpinx which have come under my observation have not exceeded 16 cm. in length, with a diameter of 8 cm. Cullingworth* removed one containing nearly a litre of fluid. The walls of these cysts were so thin that the fluid probably leaked through them in the same way that it exudes from a very tense ovarian cyst with attenuated parietes, and is gradually absorbed by the peritoneum. So thin are the walls in some of these hydrosalpinges that even when very carefully manipulated during operation, they rupture; it is very probable that these dilated tubes undergo spontaneous rupture, the cyst walls afterwards atrophying. We know too well that such an event sometimes terminates the course of a pyosalpinx

* "Diseases of the Fallopian Tube," 1895.

by setting up fatal peritonitis; but the fluid of a hydrosalpinx would be tolerated by the peritoneum in the same way that it tolerates fluid from parovarian cysts when they spontaneously rupture. My reasons for such an opinion are founded on the following evidence. I have had many opportunities of making *post-mortem* examinations of the bodies of prostitutes, many of them having led a life of vice

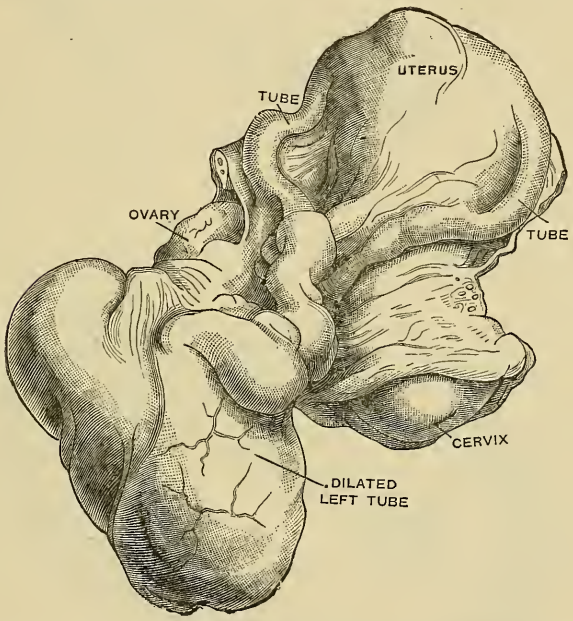

Fig. 96.—Hydrosalpinx in a late Stage. The right tube and ovary have become sclerosed.

of the lowest form. In most of them double hydro- or pyosalpinx existed. In three instances in which I examined the bodies of harridans I found one or both Fallopian tubes represented by an impervious cord, and the ovaries atrophied and unrecognisable (Fig. 95). This induces me to believe that the frequency of tubal disease between the age of twenty and thirty-five years, and its relative rarity after the fortieth year, are to be accounted for by the fact that if the individual survive the dangers incidental to an inflamed and distended tube the diseased parts atrophy (Fig. 96).

Anatomical evidence indicates that when the infective qualities of the pus are not very great, a pyosalpinx may resemble a chronic abscess, and give rise to few symptoms. It is this form of pyosalpinx which I believe becomes slowly and passively dilated with fluid, and is transformed

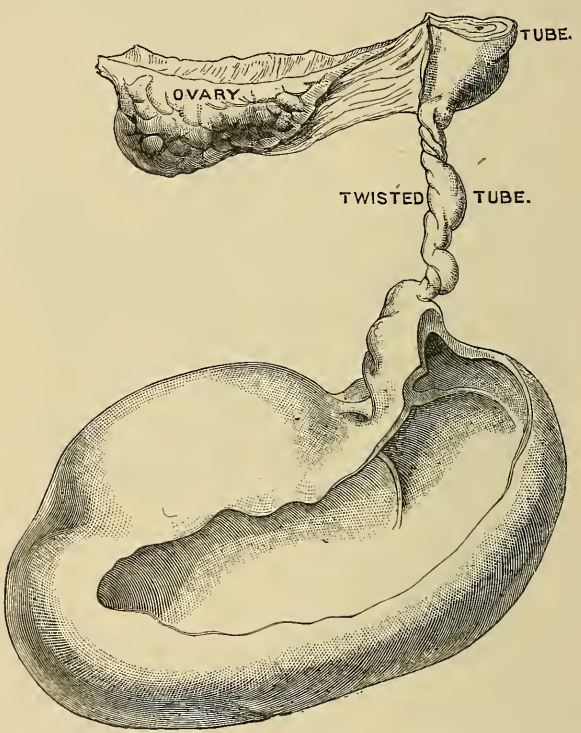

Fig. 97.—Hydrosalpinx with Twisted Pedicle.

into a hydrosalpinx. My reasons for believing that a hydrosalpinx is often a late stage of pyosalpinx may be summarised thus :—

(1) Hydrosalpinx is not found in acute cases.

(2) In many chronic cases hydrosalpinx is found on one side of the uterus and a progressive pyosalpinx on the other.

(3) The ampulla of a tube may be dilated into a hydrosalpinx, and the isthmus contains pus.

(4) The fluid contained in a hydrosalpinx will sometimes be colourless, but the recesses of the tube contain caseous material and cholesterine.

(5) The dilated portion of the tube in hydrosalpinx may, as in pyosalpinx, communicate with an enlarged ovarian follicle to form a tubo-ovarian cyst.

Axial Rotation of a Hydrosalpinx.—Dilated Fallopian tubes sometimes rotate and twist their pedicles. An example of this is represented in Fig. 97. The specimen is in the Museum of the Royal College of Surgeons, London; it accompanied my Jacksonian Essay, 1892. It was removed by Mr. Henry Morris. I assisted at the operation, and was able to observe the condition thoroughly. The fluid contents were of a chocolate colour. The portion of the tube intervening between the cyst and uterus was tightly twisted three times and a half. The cyst wall had strong adhesions to the adjacent parts of the mesometrium and pelvic peritoneum, and doubtless received nutrient vessels from this source, for its relations with the blood-vessels which normally supply this part of the tube were obstructed in the twisted pedicle.

Hartmann and Delbet* have recorded examples of axial rotation of distended tubes.

When ovarian or parovarian cysts undergo axial rotation, the Fallopian tube is necessarily involved, and in cases where actual separation occurs it is usually the last part of the pedicle to be detached.

Intermitting Hydrosalpinx.—It has been stated on clinical evidence that the fluid in a hydrosalpinx may escape through the uterus, the blockade at the uterine end of the Fallopian tube being raised. Such a condition is termed "hydrops tubæ profluens," the escape of fluid taking place at irregular intervals. Profuse discharges of pus and fluid occur in connection with pyo- and hydro-salpinx, accompanied by

* "Annales de Gyn. et d'Obstét.," 1894.

a diminution in the size of the tumour, due to the formation of a fistula between the cyst and the rectum, or the vagina.

It is a fact of some interest that the uterine end of the Fallopian tube is rarely obliterated in salpingitis. Of course, the tumidity of the mucous membrane would be sufficient in most cases to obstruct the passage of fluid from the tube into the uterus.

Skene Keith * has recorded the case of an unmarried lady thirty-six years of age, who had suffered from the age of twenty years from discharges of fluid from the uterus, which were so profuse as to render it necessary to have her dresses lined with waterproof cloth, and every night her bed had to be made up as for a confinement. The discharge was thin, had a heavy sickly odour, and was like dirty water.

At last, to remedy the condition, the ovaries and tubes were removed, but nothing was found to account for the fluid.

This remarkable case makes it clear that gushes of watery fluid from the uterus must not by themselves be accepted as evidence of intermitting hydrosalpinx.

Sclerosis of the Tubes.—Every tube affected with chronic salpingitis does not necessarily relapse into pyosalpinx or hydrosalpinx. It may undergo a change conveniently termed sclerosis.

In the early stages of salpingitis, as has already been stated, the tubal tissues are infiltrated with inflammatory exudate, and the tubes are large and succulent. In some cases the exudate organises and the proper tissues of the tube atrophy, and the tube itself is transformed into a dense cord of fibrous tissue, traversed by an irregular canal representing the original lumen of the tube. These changes are identical with those described as sclerosis in other organs, and with those occurring in the walls of the male urethra subsequent to chronic urethritis.

Sclerosed Fallopian tubes are sometimes a source of danger, as small abscesses may form and perforate the

* *Lancet*, 1891, vol. i. p. 985.

tubal wall, leading to adhesions with adjacent coils of bowel, and causing death by intestinal obstruction.

Sclerosis of the tubes is a very slow process; it probably requires six years from the date of the primary infection to effect the change. It is not unusual to find a hydrosalpinx on one side and sclerosed tube on the other (Fig. 96).

CHAPTER XXVII.

NEOPLASMS OF THE FALLOPIAN TUBE.

Neoplasms of the Fallopian tube are excessively rare. They are *adenoma, myoma, myxo-fibroma, carcinoma,* and *sarcoma.*

Adenoma.—When describing the structure of the tubal mucous membrane, the question of the glandular nature of its recesses was fully discussed. If the Fallopian tube contain

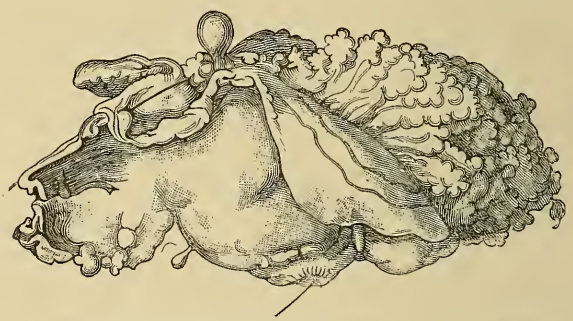

Fig. 98.—Adenoma of the Fallopian Tube. (After *Doran.*) (Museum, Royal College of Surgeons.)

no glands, it is impossible that it can give rise to a primary adenoma. On the other hand, if the mucous membrane be glandular the occasional occurrence of an adenoma is not only possible, but probable.

It is quite certain that adenomata of an interesting and characteristic type occur primarily in the tube.

In 1879 Doran* exhibited to the Pathological Society, London, a Fallopian tube removed by Sir Spencer Wells from a maiden lady fifty years of age. On laying open the tube it was found filled with cauliflower-like excrescences, covered with mucoid fluid, which issued from the unclosed abdominal ostium. The general appearance of the tumour is well

* Trans. Path. Soc. Lond., vol. xxxi. p. 174.

represented in Fig. 98. The excrescences grew from all parts of the mucous membrane in the dilated portion of the tube Several pedunculated cysts with thin walls rise from amidst the excrescences, and contain papillary outgrowths. The free surfaces of the outgrowths are covered with columnar

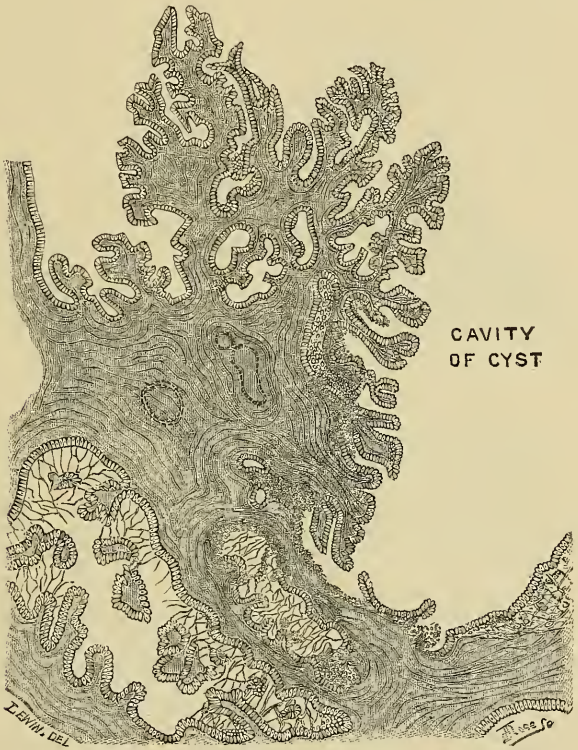

Fig. 99.—Microscopic Characters of a Fallopian Adenoma.

epithelium. Some of the cells bear cilia. The stroma is made up of small fusiform connective tissue cells, and is poorly supplied with blood-vessels. The microscopical and naked-eye characters of the growth induced Doran to describe it as a papilloma.

Whilst engaged in working out the morphology of the tubal mucous membrane, I took the opportunity of re-examining and figuring the microscopical characters of this rare specimen, and had no difficulty in coming to the

conclusion that it is an adenoma developed on the type of the glandular recesses found in the Fallopian tube. This relationship is well brought out when Fig. 99 is compared with Fig. 83, showing the mucous membrane in the tube of the Macaque monkey.

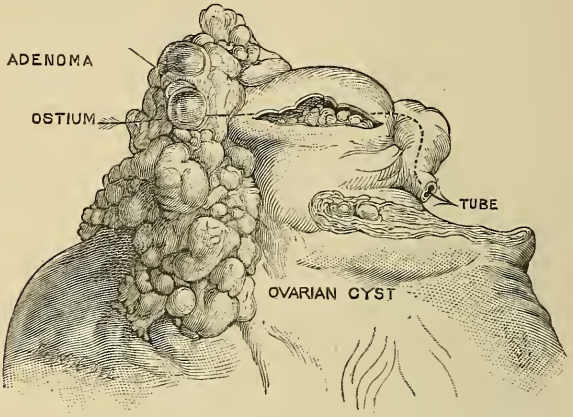

Fig. 100.—Adenoma of the Fallopian Tube. (Dr. Walter's case.)

Dr. W. Walter, of Manchester, was good enough to place in my hands for examination an even more convincing specimen of Fallopian adenoma than the one just considered.

The specimen consisted of a large oöphoronic cyst with a distended Fallopian tube. On examining the tube, its abdominal ostium was found largely dilated, and a luxuriant mass of vesicles, like a bunch of grapes, protruded from it, producing an appearance not unlike a cornucopia (Fig. 100).

On laying open the Fallopian tube the vesicles were found to involve the outer third of the tube, and to spring from the mucous membrane. Sections prepared from the base and solid parts of the tube, when examined under the microscope, exhibited the structural characters of an adenoma (Fig. 101). The solid portion of the tumour was composed of delicate connective tissue, in which were embedded glandular acini, lined with a single layer of regular columnar epithelium. In some parts of the tumour, especially near the surface, cystic spaces containing sprouting masses of intra-cystic growth were found.

The specimen differed from Doran's case in that it contained a far larger proportion of stroma.

An interesting feature in the clinical history of these cases is the co-existence of hydroperitoneum. In the case described by Doran the fluid in the abdomen was removed by paracentesis on four occasions between March, 1878, and the removal of the tumour in April, 1879, on which occasion 10 litres of fluid was evacuated. In addition, the patient suffered from fluid effusions in the right pleura, for which she was twice tapped. After the removal of the right tube, with the tumour contained within it, the effusions ceased, and the patient was in good health in 1886.

In Dr. Walter's patient a quantity of fluid was present in the belly at the time of the operation.

The relation of hydroperitoneum to these adenomata associated with patency of the tubal ostium has been made the subject of careful and suggestive study by Doran, to

Fig. 101.—Microscopic Characters of the Tubal Adenoma shown in Fig. 100.

which reference has already been made, and, as he states:—"The ostium of the tube remained patent, and hydroperitoneum persisted until the diseased tube was removed. The evidence that the secretion escaped from the ostium was positive."

An additional case has been published by Dr. Doleris* which occurred in a woman twenty-eight years of age.

* *Bull. de la Soc. Obstet. et Gyn.*, Paris, Jan., 1890.

Both ovaries and tubes were removed. The right tube formed a cyst of the size of a small nutmeg. Masses of papillomatous growths sprang from the inner wall of the tube. The uterine end of the canal was very narrow. There was no fluid in the cœlom. A peculiar clinical feature in this case was the discharge of large quantities of sero-sanguineous fluid from the vagina. An attempt had been made to cure this by curetting the interior of the uterus. The effect of this operation was to produce right-sided parametritis. The discharges after the operation became continuous, and the fluid pale yellow and of a syrupy consistence, which stiffened linen like starch.

Myoma.—Considering the frequency of myomata in connection with the uterus, it is inexplicable that similar tumours should so rarely originate in the Fallopian tubes.

Reference is often made to a specimen recorded by Simpson,* but the account of it is so poor, and the drawing intended to represent it so crude, that it is of no value.

Spaeth † has reported the clinical history of a myoma of the Fallopian tube removed by Prochownick from a woman thirty-nine years old. The tumour was somewhat oval in shape, $5\frac{1}{2}$ by $4\frac{1}{2}$ cm., and had an average thickness of 4 cm. There was no trace of inflammation, and the microscopical characters of the mass suggested a general hypertrophy of the connective and muscle tissues of the tube.

A thorough search through special periodical literature of the past ten years leads me to emphasise Virchow's statement that myomata originating in the muscular tissue of the Fallopian tube are very rare, and are almost always so small as not to merit special mention.

The only example which has come under my observation I removed from a woman twenty-nine years of age. The myoma equalled a Tangerine orange in size, and occupied the tube at the junction of the uterine and middle thirds. The ovary was occupied by a dermoid (Fig. 102). On section the tubal tumour resembled a uterine myoma, and on

* "Clinical Lectures on the Diseases of Women," p. 540.

† "Ein Fall. von Fibroid der Eileiter"; *Zeitsch. für Geb. und Gyn.*, Bd. xxi. s. 363.

microscopical examination was found to be composed of typical unstriped muscle cells.

The operation was performed in 1892, and in 1896 the woman was quite well. She had nearly lost her life in two previous labours, and the fœtuses were dead; since the removal of the tumours she has had an easy labour and a living child.

Fibro-myxoma.—Sänger and Barth * have described a

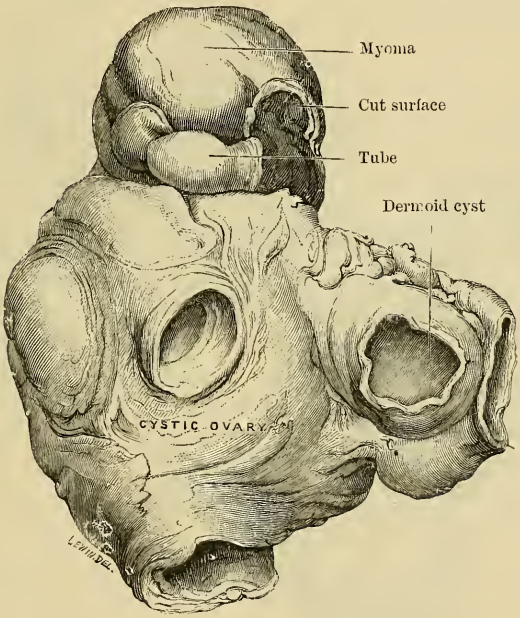

Fig. 102.—Ovarian Dermoid and a Myoma of the Tube.

very extraordinary example of multiple tumours connected with the tubal fimbriæ (Fig. 103). The specimen occurred in a woman twenty-six years of age. At the operation there was some free fluid in the belly. The patient recovered and conceived soon after the operation, but aborted at the second month.

Microscopically, the essential histologic features were those of a fibro-myxoma.

* Martin, "Die Krankheiten der Eileiter," 1895.

Carcinoma.—The fact that the Fallopian tube may be the seat of an adenoma leads us to expect that it would occasionally be affected with primary cancer. The small amount of trustworthy evidence forthcoming on this subject is sufficient to assure us that this dreadful disease is of extreme rarity in the tubes.

It is as yet impossible to write a general account of the

Fig. 103.—Fibro-myxoma of the Tubal Fimbriæ. (After *Martin.*)

affection, either from a pathological or a clinical standpoint, but there can be little doubt that the widespread interest now manifested in the diseases of the Fallopian tubes will soon lead to the accumulation of evidence of a trustworthy character, which will enable us to come to some conclusion as to its probable frequency and clinical characters.

In the meantime, as an example of the method in which such cases should be investigated, critically analysed, and duly recorded, I would refer to Doran's admirable

monograph on *Primary Cancer of the Fallopian Tube*,* and also to the sequel of the case published subsequently. It contains a very accurate record of a remarkable case. The histology of the parts is illustrated by some careful drawings. The latest contribution to this subject is an article on "Carcinoma Tubæ," by Sänger and Barth.† These authors tabulate the recorded cases.

Secondary cancer of the tube has never been recorded, but cancer of the body of the uterus extends along the mucous membrane, and invades the tubes. This I have seen on several occasions.

It has been observed by many who have had opportunities of conducting *post-mortem* examinations in advanced cases of uterine cancer, that it is unusual to find the tubes invaded when the cancer originates in the cervix; but it is common to find the tubes in the condition of hydro- or pyo-salpinx under such conditions. When the disease extends upwards into the cavity of the uterus, it will occasionally involve the tubal mucous membrane, but extension of uterine cancer in this direction is probably the exception rather than the rule.

Sarcoma.—This is a very rare form of tumour affecting the tube, and at present must be regarded as a pathological curiosity.

* Trans. Path. Soc. London, vol. xxxix. p. 208; and vol. xl. p. 221.

† Martin, "Die Krankheiten der Eileiter," Berlin, 1895. *See also* Cullingworth, "Diseases of the Fallopian Tubes," 1895.

CHAPTER XXVIII.

THE DIAGNOSIS AND TREATMENT OF CHRONIC TUBAL DISEASE.

It unfortunately happens that the effects of chronic salpingitis are imitated by several morbid conditions, so that positive diagnosis is very difficult. The history of the case will often bring to light the fact that the patient has had gonorrhœa, but much more frequently we shall obtain evidence that some years previously she had a difficult labour, or an abortion complicated with septic troubles, and since then has remained sterile. She will further add that after the illness her menstrual periods began to be profuse, and of longer duration. In some, menstruation is too frequent. In most, defæcation is painful, and sexual congress so painful that it is avoided. In a certain proportion of cases there is a purulent vaginal discharge. In tubercular salpingitis there is usually *amenorrhœa*.

On examining the abdomen an irregular tender swelling may be sometimes detected in one or both flanks; more frequently there is an indefinite swelling, and in some, on palpation, a sense of resistance can be made out, but in very many cases no swelling can be detected by palpation of the abdomen.

On vaginal examination there will be found lying on each side of, or behind, the uterus an elongated swelling, which usually gives rise to great pain when pressed by the examining finger. Not infrequently the uterus is acutely retroflexed, and then the uterine fundus, with the enlarged tubes and ovaries, forms a rounded ridge running transversely across the pelvic floor.

As a rule, a moderately distended tube can only be felt through the vagina, or by the bi-manual method of examination: that is, when the index finger is in the vagina and the opposite hand pressed upon the abdominal wall, the

fingers of each hand will compress between them the enlarged body, be it tube or ovary.

Frequently an enlarged or distended tube is more readily felt through the rectum than through the vagina. As collections of fæces in the rectum may not only lead to false notions as to the existence of an inflamed tube, but render difficult, as well as disagreeable, a proper rectal examination, it is always advisable to take precautions to have the rectum thoroughly emptied by means of an enema some hours before the examination.

Tactile Judgment.—This is a very important factor in the diagnosis of pelvic swellings. To estimate the size, consistence, mobility, or fixity, etc., of a tumour lying in close relation with the uterus requires experience. At consultations the most varied opinions are expressed: a pelvic swelling, which one will estimate as equal in size to a walnut, to another feels as large as an egg. This difference in the delicacy of touch often leads to erroneous opinions at consultations, and is productive of much misunderstanding.

In a general way it may be stated that *when a Fallopian tube is so distended as to render it capable of being felt above the pelvic brim, it is liable to be, and often is, mistaken for an ovarian cyst.*

On the other hand, when ovarian and parovarian cysts are not large enough to be felt above the pelvic brim, they closely simulate pelvic cellulitis, or distended tubes.

In a general way it may be stated that it is impossible accurately to diagnose between the various forms of tubal and the following forms of ovarian disease:—

1. Tubercular abscess of ovary.
2. Apoplexy of the ovary.
3. Small ovarian cysts, tumours, or dermoids.
4. Small parovarian cysts.
5. Gravid tubes previous to rupture or abortion.

The following conditions are very liable to be mistaken for tubal disease:—

Retroflexion of the uterus.
Pelvic cellulitis.
Fæcal accumulation in the rectum.

A kidney in the hollow of the sacrum.
A small uterine myoma.
Cancer of the sigmoid flexure of the colon.
Abscess, due to inflammation of the vermiform appendix, burrowing into the mesometrium.
Tumours of the sacrum or innominate bone.
Tumours of the mesometrium, including echinococcus (hydatid) cysts.

Small Tumours of the Ovary.—When speaking of cystic disease of the ovary we are so apt to associate the condition, especially when discussing the question from the surgical side, with large tumours arising above the pelvic brim, that it is often forgotten that small cysts of the ovary not infrequently produce more discomfort and actual pain than large tumours of this organ. The ovary, like the testis, is acutely sensitive to pressure, and when it is slightly enlarged and increased in weight it drags upon its attachments, so that instead of hanging *suspended* in the pelvis it *lies* on the floor of the recto-vaginal fossa. The ovary under such conditions is apt to give rise to pain during defæcation, especially the left one. In these cases pain during sexual congress is a prominent symptom, and frequently the one for which women most urgently seek relief. On examining the patient a rounded movable body about the size of a walnut is felt behind the uterus which, when pressed by the examining finger, gives rise to pain. When the ovary is movable it can rarely be mistaken for a distended tube, but when bound down by adhesions it is very apt to be regarded as an enlarged tube.

The ovarian cysts that cause most pain are small dermoids, equal to, or scarcely larger than, a Tangerine orange. These are occasionally firmly fixed by adhesions to the peritoneum in the recto-vaginal fossa, and cause great suffering. They are usually diagnosed as inflamed tubes.

Cysts which are freely movable are often sources of pain. Women with a cyst such as is represented in Fig. 57 complain of a dragging pain, probably due to the *tension* it exerts upon the tube, for in all the specimens I have examined in which the cyst was situated in this peculiar relation to

the tubo-ovarian ligament the tubes were greatly elongated. It is possible that the strain exerted upon the tubo-ovarian ligament produces painful sensations.

Other conditions of the ovary likely to lead to error in the differential diagnosis of ovarian enlargement and tubal distension are hæmorrhages into its follicles, or into the stroma—the so-called "apoplexy of the ovary"—and ovarian growths, such as myoma or sarcoma, in their early stages.

The clinical signs of ovarian disease are very similar to those of testicular disease, in so far as pain is concerned. Hæmorrhage into the substance of the testis, or inflammation, causes intense pain; whilst a large hydrocele produces no pain, and a sarcoma, in most cases, only gives rise to a feeling of discomfort, due to the tension it exerts upon the spermatic cord.

The differential diagnosis of pelvic swellings is further discussed in chapter xlviii.

Pelvic Pain.—The most misleading symptom of all is *pain*, especially when most pronounced at the menstrual period. Such pain has been described as ovarian neuralgia, and has induced surgeons in some instances to remove the ovaries, even in the absence of physical signs. On two occasions such ovaries have been submitted to me for microscopical examination, but I have not succeeded in detecting any evidence of disease in them.

This is consonant with what we find in other organs. Young women often suffer from pain, sometimes of severe character, in the breast, but the most careful examination fails to reveal any lesion which explains the painful sensation. In the same way, highly sensitive nervous men complain of pain in the testicles.

On one occasion I obtained the advice of Sir James Paget concerning a young lady who experienced severe pain in the left breast, for which no reasonable cause could be assigned. This acute observer stated that he had frequently noticed that in young women interested in the study of the *fine arts*, sensations, which in others cause little or no concern, are frequently in them the source of inconvenience and much suffering.

On looking over the clinical notes of my cases I find a

great deal of evidence that supports this highly important observation.

It must be remarked that the removal of painful organs in such cases does not destroy the pain. It may relieve for a time, but sooner or later pain returns with its former intensity, resembling in this respect inveterate trigeminal neuralgia.

CHAPTER XXIX.

THE TREATMENT OF SALPINGITIS.

Acute Salpingitis ensuing upon *labour* or *abortion* or gonorrhœa, demands, during the acute stages, absolute rest in bed and the regular use of mild vaginal injections. It must be remembered in treating these cases that the pelvic pain of which the patients complain indicates that the inflammation has extended beyond the tubes, and that in addition to salpingitis there is infection of the pelvic peritoneum.

In the early stages, especially when the symptoms supervene upon abortion, it is difficult accurately to discriminate between salpingitis and pelvic cellulitis; this is an additional reason for enjoining absolute rest in order to prevent the formation of a pelvic abscess.

The treatment of the early stages of salpingitis is very simple, yet it is not too much to state that if more attention were directed to this disease at its commencement, many women would be saved much subsequent misery and pain.

When the mucous membrane of the tubes has become seriously damaged, when the tubes themselves have become fixed by adhesions to surrounding structures, the ovaries involved in the inflammation, and the ostia of the tubes occluded, then drugs and rest are of little avail.

When the patients are in good circumstances, and able to lead an idle life, they often become chronic invalids. It is such patients who are able to indulge in the luxury of visits to Continental health resorts, and try the effects of various springs and baths, and the mud- or moor-baths of Bohemia.

In women who have to perform household duties, and even get their own living, a life of luxury and ease is out of

the question. Under such conditions it is necessary to adopt more radical measures.

The ordinary rules of surgery suggest that when the physical signs and history of the case indicate that the tubes are occluded and distended with pus or other fluid, producing so much pain and inconvenience as to cause the patient to lead the life of a chronic invalid, then it is justifiable to remove them. To dilate the cervical canal and scrape the interior of the uterus, or tap a pyosalpinx through the vagina, or attempt to disperse pus by electricity, by moor-baths, or by mild purgatives, are modes of treatment which can only be described as ridiculous, and in many cases they are highly dangerous. It must be confessed that the whole difficulty in the treatment of these cases lies in the diagnosis. If the surgeon could be sure his patient were suffering from a collection of pus in the tubes, he would have no more hesitation in removing them than he feels in recommending the excision of a sacculated and suppurating kidney or an ovarian tumour.

It is to be hoped that now so much close attention is being devoted to the diseases, we shall be able to formulate some more certain signs of the presence of pus in the tubes, which will enable us to advocate the necessary lines of treatment with more confidence.

Removal of the Fallopian tubes and ovaries is necessary in the following conditions :—

1. Pyosalpinx and tubo-ovarian abscess.
2. Hydrosalpinx.
3. Tubercular salpingitis.
4. Ovarian abscess.

In these affections the operation is not only justifiable, but it is the only means of radical treatment. It is sanctioned and practised by those who have had the greatest experience in ovariotomy, and an examination of their lists of recorded cases shows, that under the impression they were dealing with ovarian or parovarian cysts, they have removed Fallopian tubes, sometimes filled with pus, sometimes with less harmful fluid.

Tubercular Salpingitis.—In this disease the operation should only be undertaken when there is no evidence of tubercle in other organs, such as the lungs, bladder, kidneys, or peritoneum.

The records of operations for this form of tubal disease show that they are attended with a very high rate of mortality, and convalescence is, as a rule, prolonged.

Results.—The *mortality* of oöphorectomy as compared with ovariotomy is distinctly higher. All experienced ovariotomists are unanimous on this point.

It is a significant fact that many surgeons who have published long lists of ovariotomies, in order to parade their manipulative skill, have abstained from publishing in the same way records of their oöphorectomies.

THE OPERATIVE TREATMENT OF NEUROTIC CONDITIONS ASSOCIATED WITH THE OVARIES.

The removal of the ovaries and tubes has been recommended and practised for the relief of such conditions as:—

1. Epilepsy and insanity.
2. Dysmenorrhœa.
3. Ovarian neuralgia.

In this group the procedure has not been followed by encouraging results; indeed, they are so unsatisfactory that those who have had greatest experience in this class of surgery are almost unanimous in condemning the operation, save under very exceptional conditions; even then the operator should safeguard himself by seeking confirmatory opinion.

It would be tedious and useless to enter into a full discussion of the reasons that have been urged against the routine employment of so severe an operation for the relief of these conditions. The chief objections are summarised in the following clauses:—

1. In a very large proportion of cases the removal of the ovaries and tubes fails to relieve the patient.
2. In many cases the operation aggravates the symptoms.

3. In only a very small proportion of cases has there been *permanent* improvement.
4. Many cases reported a few weeks or months after the operation as *cured* have subsequently relapsed.

The objections may be briefly expressed in this way: *The inherent risks of the operation and the uncertainty of the result.*

It has been pertinently suggested that *if the positive benefits of the operation were as assured as its rate of recovery, the opposition to it would soon cease.* In answer to this, it should be remembered that we are not in possession of trustworthy statistics on which to base even an approximate rate of mortality.

The arguments adverse to the removal of the ovaries simply because they are believed to be a source of mental alienation or neuralgia, in the absence of physical signs indicating disease of these organs, are many. Those interested in the subject will find them ably set forth in articles by Sir Spencer Wells* and Dr. Playfair.†

In many instances where oöphorectomy has been carried out for the relief of pain, unaccompanied by objective signs in the pelvic viscera, the operators have pointed out, in justification of the interference, that the ovaries were cystic. There is a subtlety in this excuse. The so-called practical surgeon, as a rule, affects to scoff at pathology. Such men, I find, apply the term *ovarian* to cysts of the size of a Tangerine orange and upwards. When they excise an ovary for pain they cut into the organ, and finding ripe follicles, describe it as a cystic ovary. Every normal ovary is cystic, hence an excuse is readily found. The ovary represented in Fig. 3 is a perfectly normal gland; it is cystic, but the cysts are mature follicles. Such ovaries have been removed under the impression that the presence of the cysts justified the operation. The ovaries are in many respects analogous to the breasts. A healthy woman may have small breasts, and another her equal in age and size, perhaps, possesses a pair of large plump mammæ, yet the glands in each individual

* *International Journal of the Medical Sciences*, vol. xcii. p. 455.

† Trans. Obstet. Soc., vol. xxxiii. p. 7.

fulfil their function. The same is equally true of the ovaries. That shown in Fig. 3 was as healthy and capable as the large gland in Fig. 1.

In an organ liable to vary so much, and naturally concerned in forming cysts, it is not surprising that healthy ovaries should be frequently mistaken by the inexperienced for diseased glands.

Part III.

TUBAL PREGNANCY.

CHAPTER XXX.

THE CAUSES OF TUBAL PREGNANCY.

NORMAL pregnancy, or the state of "being with young," is the outcome of two factors:—

1. Impregnation.
2. The retention of an oösperm (fertilised ovum) in the cavity of the uterus.

In order to reach the uterine cavity an ovum must traverse the Fallopian tube.

When an oösperm (fertilised ovum) is retained in the tube, it continues to develop, and gives rise to the condition known as **tubal pregnancy.**

One of the greatest advances in surgery since the establishment of ovariotomy is the general appreciation of the fact that the various forms of abnormal pregnancy, formerly classed as extra-uterine, have their origin in the Fallopian tube.

Concerning the cause or causes of tubal pregnancy nothing is known, and this obscurity will continue until reliable evidence is forthcoming in regard to the situation in the genital passages where ovum and spermatozoon normally meet.

It is reasonable to believe that fertilisation normally happens in the uterus, but when it occurs in the tube it is accidental, and tubal gestation is the consequence.

Obstruction to the transit of ova will not explain matters, for it is a fact that an oösperm is more often retained in the wide ampullary section of the tube than in its uterine segment. My own observations teach me that tubal

pregnancy is the result of active rather than obstructive causes. The union of a spermatozoon with the nucleus of an ovum not merely initiates in the previously passive cell most marvellous and rapid changes, ending, under favourable surroundings, in the production of a new individual, but in some mysterious way exerts an extraordinary influence on the reproductive organs. It is probable that when an ovum is fertilised, the resulting oösperm engrafts itself at once on the adjacent mucous membrane, whether it be tubal or uterine.

Tubal pregnancy may happen as a first pregnancy in women who have been married eight, ten, or even twenty years. A woman thirty-seven years of age, from whom I removed a gravid tube five weeks after primary rupture, had been twice married, her matrimonial life extending over seventeen years, yet her first pregnancy was tubal. It may follow normal gestation or an abortion within a few months, or occur as a first pregnancy in a woman of twenty or forty years of age. A Fallopian tube may become gravid in the newly-married or in the mother of a large family. Both tubes may, in very exceptional instances, be gravid concurrently, or one tube may become pregnant years after its fellow. Very rarely two oösperms are retained in the same Fallopian tube—**twin tubal pregnancy.** Tubal may complicate uterine pregnancy.

Tubal Pregnancy and Antecedent Sterility.—An analysis of a large number of cases establishes the fact that the occurrence of tubal pregnancy is *often* preceded by a long interval of sterility. As this last statement is often used in an uncertain manner, it will be useful if we attach to it some definite meaning.

Matthews Duncan, from a careful consideration of 3,722 cases of delivery, came to the conclusion "that there is no good presumption of sterility until the fourth year of married life has been entered upon;" and the accompanying table shows the intervals in years between marriage and the birth of the first child in his collected cases:—

Less than 1 year	608
1 „	2390
2 years	437
3 „	133

Less than 4 years	...	...	...	61
5 „	...	...	...	32
6 „	...	...	...	27
7 „	...	...	...	12
8 „	...	...	...	5
9 „	...	...	...	5
10 „	...	...	...	1
11 „	...	...	...	3
12 „	...	...	...	4
13 „	...	...	...	2
14 „	...	...	...	0
15 „	...	...	...	1
16 „	...	...	...	0
17 „	...	...	...	0
18 „	...	...	...	1

Taking these facts as a basis, it will be convenient, in reference to tubal pregnancy, to regard an unfruitful interval of four years after cohabitation as a "period of sterility." Eight years would be a long, and sixteen years a very long, period of sterility.

In order to obtain further evidence in relation to this matter, I collected 100 cases of tubal pregnancy reported in periodical literature (American, British, French and German), in order to determine, as near as possible, the most common period of life for this accident. The cases were distributed thus:—

20–25	= 10
25–40	= 86
40–45	= 4
	100

The number of cases in each lustrum (twenty-five to thirty, thirty to thirty-five, thirty-five to forty) were almost equally distributed. I have further tested the conclusion by reference to my own cases and those I have witnessed in the practice of my colleagues, and the results are very constant.

In regard to uterine gestation, Matthews Duncan points out that the interval twenty-five to thirty-five may be regarded as the great child-bearing period of life, and that the average duration of the child-bearing period is twelve years. Relative to this, it may be mentioned that in some cases in the lustrum thirty-five to forty the fœtus had been

sequestered in the mesometrium (broad ligament) several years. Thus the period of greatest functional activity of the uterus represents also the period of greatest liability of the tubes to become gravid.

Clinical experience has taught me that these facts in regard to age and child-birth, and a preceding "period of sterility," are points to be considered in dealing with suspected cases of tubal pregnancy.

Tubal Pregnancy and Chronic Salpingitis.—The fact that pregnancy occurs in the Fallopian tubes after a long period of sterility in women who have borne children has led some writers to believe that these patients have suffered from desquamative salpingitis, and that the destruction of the tubal epithelium hinders the ovum in its passage to the uterus.*

I have devoted much labour to the investigation of the minute changes in the mucous membrane of gravid tubes. In some specimens there is evidence of old inflammation; but it must be pointed out that salpingitis, so severe as to produce destruction of the tubal epithelium, causes profound changes in the tubes, and leads to stricture and complete occlusion of their abdominal ostia. In many specimens of very early tubal pregnancy I have failed, even after the most careful microscopic examination, to find any evidence of old salpingitis or loss of epithelium.

The museum of St. Mary's Hospital, London, contains an ovary and Fallopian tube removed from a single woman twenty years of age. She was seized with sudden violent abdominal pain, followed by signs of internal hæmorrhage. Rupture of a gravid tube was suspected, but disregarded as the hymen existed intact. She died three days later. At the autopsy a gravid tube, which had burst, was found to be the cause of death. I examined sections from the tube. Chorionic villi were abundant. The tubal epithelium was intact, and there existed no evidence of chronic salpingitis. As a matter of fact, the evidence now indicates that **a healthy Fallopian tube is more liable to become gravid than one which has been inflamed.**

* Tilt: Trans. Obstet. Soc., vol. xv. p. 155, 1873; Lawson Tait: "Ectopic Pregnancy," 1888.

Chronic salpingitis becomes even less satisfactory as an explanation of tubal pregnancy when we reflect that in some of the specimens the inflammatory changes are the consequence rather than the cause of tubal pregnancy. Although changes of this character, or mechanical conditions induced by the presence of ovarian, parovarian or uterine tumours, may explain individual cases, the chief cause of tubal pregnancy remains undetected.

CHAPTER XXXI.

THE STAGES OF TUBAL PREGNANCY.

Our knowledge of the events consequent on the retention of an oösperm in the tube is fairly complete. These events vary according to the position of the oösperm; thus gestation in the ampulla and the isthmus is called tubal, and in the

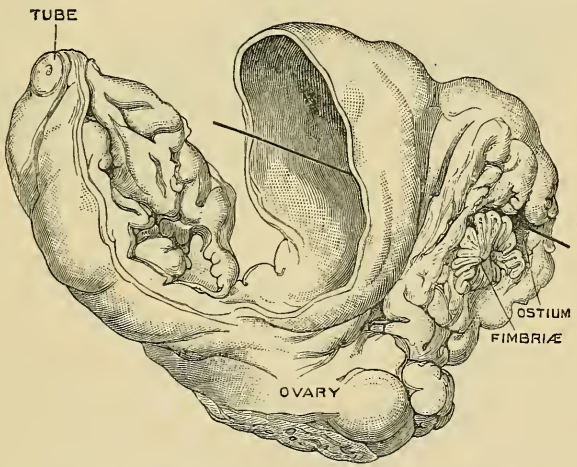

Fig. 104.—Gravid Fallopian Tube at the sixth Week. The ostium is partially occluded.

portion which traverses the uterine wall tubo-uterine pregnancy. The last variety will be considered in chapter xxxvi.

The stages of tubal pregnancy will be described in sections, thus:—

(*a*) Changes in the tube.
(*b*) The tubal mole, page 251.
(*c*) Tubal abortion, page 257.
(*d*) Tubal rupture, page 264.
(*e*) The decidua and placenta, page 269.

The Changes in the Tube.—During the first month or six

weeks that portion of the tube in which the oösperm is lodged becomes very vascular and turgid. Occasionally the walls of the tube at the site where the villi are implanted on the mucous membrane stretch and thin from the beginning of the gestation. The rapidity of the thinning varies in

Fig. 105.—Gravid Fallopian Tube at the tenth Week, showing complete Occlusion of the Ostium.
o, Ovary with corpus luteum.

different tubes; and this is doubtless due to the fact that under normal conditions the Fallopian tubes not only vary in length, but in thickness. In some individuals they scarcely exceed in thickness the vasa deferentia of the testis, or resemble the narrow tubes of the mare or cow. As the tube expands from the growth of the fœtus and its membranes, the mucous membrane is stretched and its folds are effaced. Sometimes a few of the plicæ will project within the tube as long, straggling processes.

Whilst these changes are in progress, curious alterations are taking place at the abdominal ostium, which in many cases gradually bring about its occlusion, an event usually completed by the eighth week. During the first four weeks the congestion of the parts causes turgescence of the fimbriæ, as well as of the muscular and serous tissues adjacent to them. When the parts are thus swollen the margin of peritoneum adjacent to the ostium is very conspicuous, and

forms an irregular ring around the fimbriæ (Figs. 104 and 106). In another fourteen days this ring projects beyond the fimbriæ, and, lastly, contracts and hermetically closes the ostium (Fig. 105).

Careful observations of gravid tubes serve to show that occlusion of the abdominal ostium is by no means a constant sequel of tubal gestation; indeed, in some instances, as the tube is distended by the growing embryo, the ostium dilates, and I have examined specimens in which the abdominal

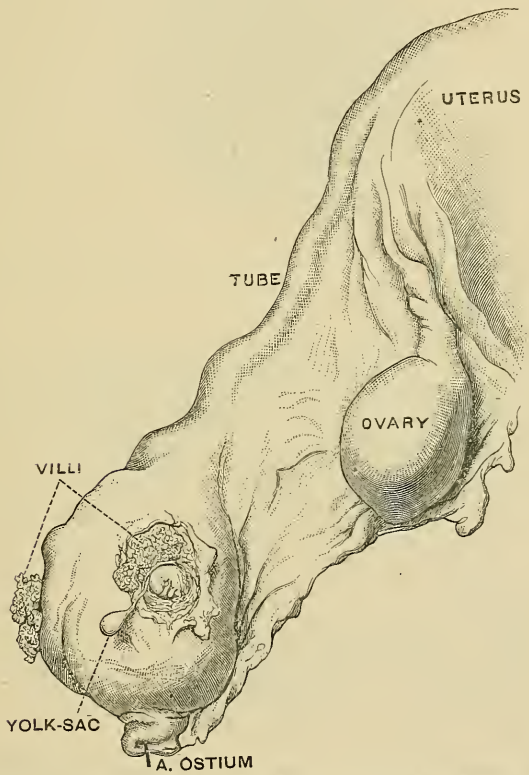

Fig. 106.—Gravid Fallopian Tube, which ruptured and caused death in twelve hours.

From a woman who died with signs of irritant poisoning after a hearty supper of mussels. The *post-mortem* examination was made on a coroner's warrant.

ostium appeared as a circular opening 4 cm. in diameter (Fig. 107). It would appear that when the oösperm is retained near the abdominal ostium, this aperture is more

likely to become occluded than when it is lodged near the middle of the tube. When the oösperm is detained in the isthmus of the tube the ostium is unaffected (Fig. 108).

The condition of the mouth of the tube in some measure influences the subsequent course of the pregnancy, inasmuch

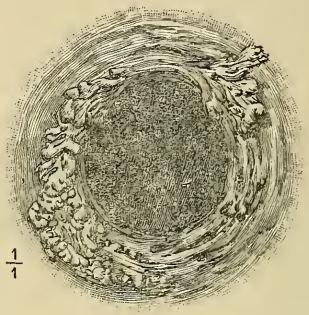

Fig. 107.—Dilated Abdominal Ostium. From a gravid mole-containing tube. Natural size.

as a widely-expanded ostium predisposes to tubal abortion; but a gravid tube with a patent abdominal ostium is also liable to rupture. A gravid tube with an occluded ostium almost invariably bursts.

Our knowledge of the condition of the uterine segment of the tube in cases of tubal pregnancy is less precise than that of the abdominal ostium, because mere examination with the naked eye, or such rough methods as the introduction of a probe or a bristle, are not satisfactory tests. The best means of investigation consist in the microscopic examination of thin sections of the uterine segment of the tube. This has been carried out in a few instances, and the lumen of the tube found to be uninterrupted.

The condition of the uterine segment of the tube is of some importance in connection with the clinical features of tubal gestation. It was assumed by some of the older writers on extra-uterine gestation that obstruction in this part of the tube would help to explain retention of the ovum in the tube. This is, of course, untenable, because it would likewise prevent spermatozoa from entering the tube. In many

cases of tubal gestation the patient complains of irregular discharges of blood from the vagina; this seems to be more especially observed in cases of tubal abortion. It is probable that some of this blood is effused into the tube and trickles through the uterine end of the tube into the uterus.

The Tubal Mole.—The changes which occur in the oösperm subsequent to impregnation are identical whether it be retained in the tube or the uterine cavity. In each situation it is liable to a curious change whereby it is converted into what is known as a "mole."

Practitioners are familiar with uterine moles; they are so common that most pathological museums contain several specimens, and few matrons terminate their reproductive period of life without producing one or more examples of the fleshy mole. The clinical expression for the event is abortion. When a mole is examined soon after its discharge it resembles a firm blood-clot in colour and consistence. On

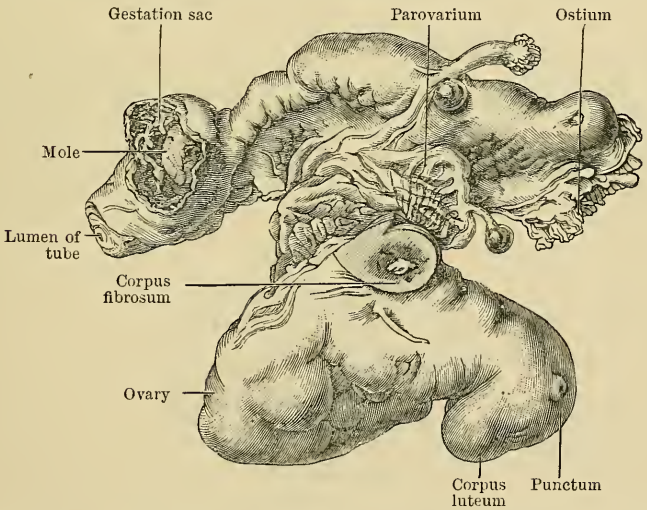

Fig. 108.—Gravid Tube. The gestation sac occupied the isthmus of the tube. The mole was equal in size to a green pea. The abdominal ostium was patent. Natural size.

dividing it, a cavity containing fluid, sometimes straw-coloured, sometimes stained red from admixture with blood, is found. The walls of this cavity are smooth and lined with amnion,

and often a misshapen fœtus is contained within, or the stump of the umbilical cord; frequently there is no trace of an embryo.

In 1889 I was able to demonstrate that moles occurred in connection with tubal pregnancy, and since that date such a

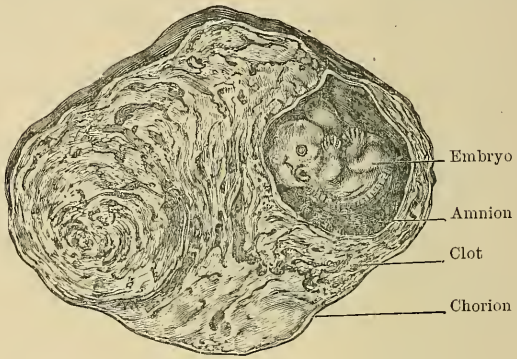

Fig. 109.—Tubal Mole in Section. Natural size.

large number of examples have been described that tubal moles have become familiar objects. Their characters may be summarised thus :—

Tubal moles vary greatly in size: some have a diameter of 1 cm., others measure 5 or even 8 cm. Small moles are globular, but after attaining a diameter of 3 cm. they assume an ovoid shape.

The amniotic cavity usually occupies an excentric position (Fig. 109). Occasionally an embryo is present, often it is misshapen and ill-developed.

In very many specimens, owing to the excentric position of the amniotic cavity, its walls are ruptured and the embryo is lost (Fig. 110).

The outer investing membrane—the chorion—is usually shaggy with villi, which become more obvious if the mole be exposed to a gentle stream of water.

In some specimens the amniotic cavity is effaced; if such moles be sectioned and examined microscopically the chorionic villi will be found cut transversely or obliquely.

Recent moles resemble a piece of blood coagulum, and are dark-red. When they have been free in the pelvic cavity,

or lodged between the layers of the mesometrium (broad ligament) for days or weeks, they are sometimes yellow externally and often firm and hard.

The majority of tubal moles are easily recognised: there is sometimes doubt when the amniotic cavity is obliterated. In doubtful cases of this kind the presence of chorionic villi determines their nature. The villi usually appear as clusters of circular bodies; ten or more may, in fortunate sections, be counted together; more frequently they occur in groups of three or four, and often a wide section of clot may be examined without finding more than two or three. Under a low power they present an external layer of epithelium, the central space being occupied by irregular-shaped cells (Fig. 111). When examined under high powers, the limiting layer is often formed of a perfectly regular row of cubical epithelium. Sometimes the interior of a villus resembles the stratum intermedium of an enamel organ. In larger villi a double row of epithelium may be detected.

The structure and mode of formation of these moles are of great interest. In the early stages of development the relations of the membranes are somewhat different to those which obtain at a later period, and it is a significant fact that moles only arise in the first few weeks following fertilisation. Soon after the chorion is shaggy with villi, the embryo will be

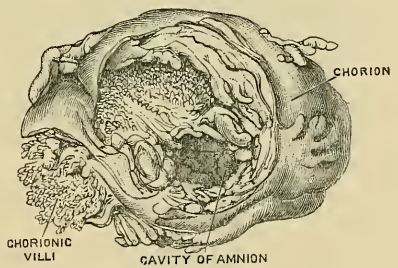

Fig. 110.—Mole. Natural size. From a case of complete tubal abortion.

found in the amnion; between the amnion and the chorion there exists a space (which may be called the subchorionic chamber) filled with albuminous fluid (Fig. 112).

As the embryo increases in size the amnion gradually

encroaches on this space and eventually obliterates it, but for a time a potential space exists between the two membranes (Fig. 113) exactly resembling that between the visceral and parietal pleura.

The most cursory examination of a typical tubal mole will

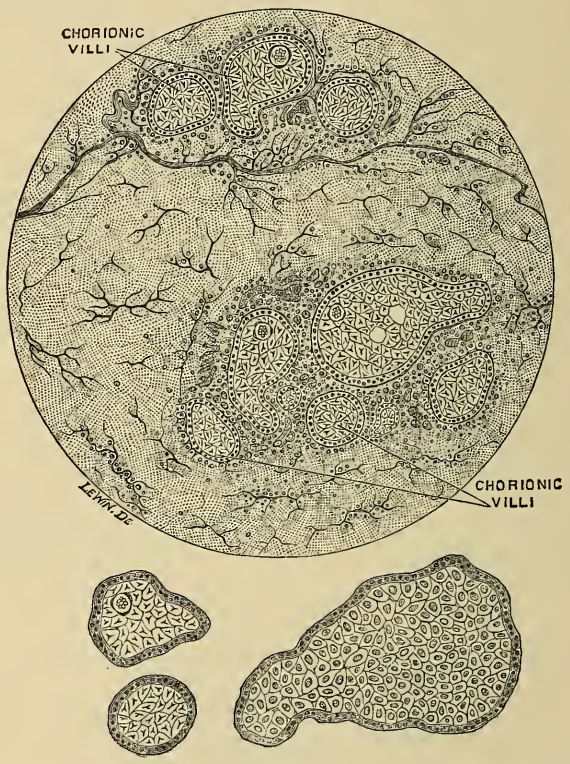

Fig. 111.—Microscopical Characters of Chorionic Villi in Section, in Blood Clot.

convince the observer that the blood is limited externally by the chorion and internally by the amnion (Fig. 113). It is obvious that this blood *occupies the sub-chorionic chamber.* This at once explains the elliptical shape of large tubal moles.

We have now to determine the source of the blood. Many have hitherto been content to believe that a mole is formed by an irruption of maternal blood into the embryonic membranes. In the face of observed facts as mentioned above,

this loose opinion falls to the ground. *The blood is furnished by the circulation of the embryo.* This view is further

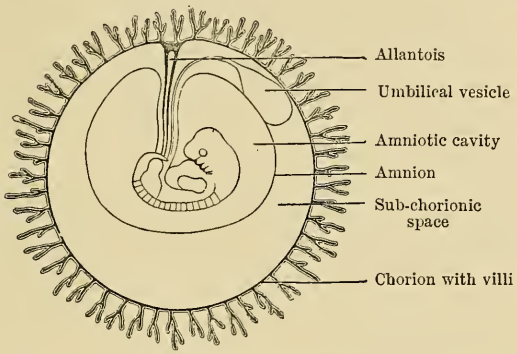

Fig. 112.—Diagram to show the Early Relation of the Amnion and Chorion and the Sub-chorionic Chamber.

supported by the character of the blood. In the embryo the blood differs from that of the adult in the fact that the red corpuscles are nucleated. Actual observations on blood from fresh tubal moles show that the *red corpuscles* are *nucleated.*

Fig. 113.—Early Tubal Embryo showing the Polar Disposition of the Villi. Natural size.

It is clear that *a tubal mole is due to blood extravasated from the circulation of the embryo into the sub-chorionic chamber.*

It must be distinctly understood that these observations only apply to blood within the chorion. It does not follow that the blood found within the sub-chorionic chamber is the result of a single hæmorrhage; careful examination of tubal moles demonstrates that the blood is often disposed in laminæ like that found in a sacculated aneurysm. This is sufficient to prove that in some instances at least the formation of a tubal mole is a gradual process.

In many cases tubal moles are found immersed in blood extravasated from the maternal vessels. Occasionally gravid mole-containing tubes come to hand in which no blood is effused between the chorion and the tube. In such cases the evidence that the blood comes from some source within the chorion is irrefragable.

CHAPTER XXXII.

TUBAL ABORTION.

It has already been pointed out that the presence of an oösperm in the outer third of the tube usually leads to occlusion of the abdominal ostium; this event is commonly complete by the end of the sixth, but is sometimes delayed to the eighth, week.

So long as this orifice remains open the oösperm is in constant jeopardy of being extruded through it into the cœlom (peritoneal cavity), especially when lodged in the ampulla of the tube; the nearer it is situated to the ostium the greater the risk of its ejection from the tube. To this accident the term **tubal abortion** is applied, for it is parallel to those early abortions occurring in uterine gestation before the end of the second month; and it further resembles them in the fact that the oösperm is nearly always converted into a mole.

In tubal abortion the mole is discharged with a copious hæmorrhage into the cœlom (peritoneal cavity) through the ostium, accompanied with the usual signs of internal bleeding, and death may occur early from the anæmia thus induced, or from shock. In such instances the mole, being very small, may escape recognition when the clot is examined, either at the operation or *post mortem*. Tubal abortion can only occur during the first two months, for when the ostium is occluded the blood cannot escape without rupture of the sac. The quantity of blood which escapes from the tube into the cœlom sometimes measures 2, 3, and even 4 litres. Tubal abortion is a subject of much interest, inasmuch as it furnishes many of the cases of pelvic hæmatocele which are ascribed to metrorrhagia, reflux of menstrual blood from the uterus, and hæmorrhage from the mucous membrane of the Fallopian tube. The reason for associating the hæmorrhage with metrorrhagia and menstruation is due to the fact that, whilst the embryo is growing in the tube, a decidua is forming in the

uterus. When tubal abortion occurs, hæmorrhage takes place from the uterus consequent on the separation and expulsion of the decidua. Should this accident happen near the time when the patient expects to menstruate, the case is apt to be regarded as reflux of menstrual fluid into the cœlom. In some cases the blood discharged from the uterus is partly derived from the gravid tube; this especially happens in cases of protracted tubal abortion. If it does not coincide with a menstrual period, it is then usually considered to be of uterine origin. It will therefore be well, in searching blood removed

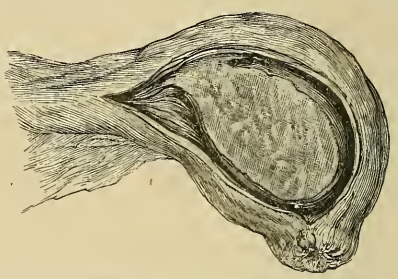

Fig. 114.—Gravid Tube with Patent Ostium. The mole is shown in section. From a case of incomplete tubal abortion. Natural size.

in abdominal operations, to examine carefully any apparently organised ovoid clot, in order to ascertain if it possess an amniotic cavity, with or without an embryo, and also to determine the existence or otherwise of chorionic villi.

It is necessary to bear in mind that in early uterine abortion the mole often fails to become completely detached from the uterine wall; bleeding recurs so long as the mole is retained. In tubal pregnancy the same thing happens, the mole remains attached by its villi and is not ejected from the tube, and gives rise to recurrent hæmorrhage (Fig. 114). This may be described as *incomplete tubal abortion*, and is more common than the complete form.

Doubts have been expressed in regard to the occurrence of complete tubal abortion. I reported the details of a case in which I found the mole during the operation lying among the fimbriæ of the tube* (Fig. 115).

* Trans. Med. Soc. London, 1892, vol. xvi. p. 48. *See also* Cullingworth, "Diseases of the Fallopian Tube," 1895, p. 47.

A few writers are disposed to quibble over the term "tubal abortion." There can be little doubt that it will be possible in the future to distinguish clinically between rupture of a gravid

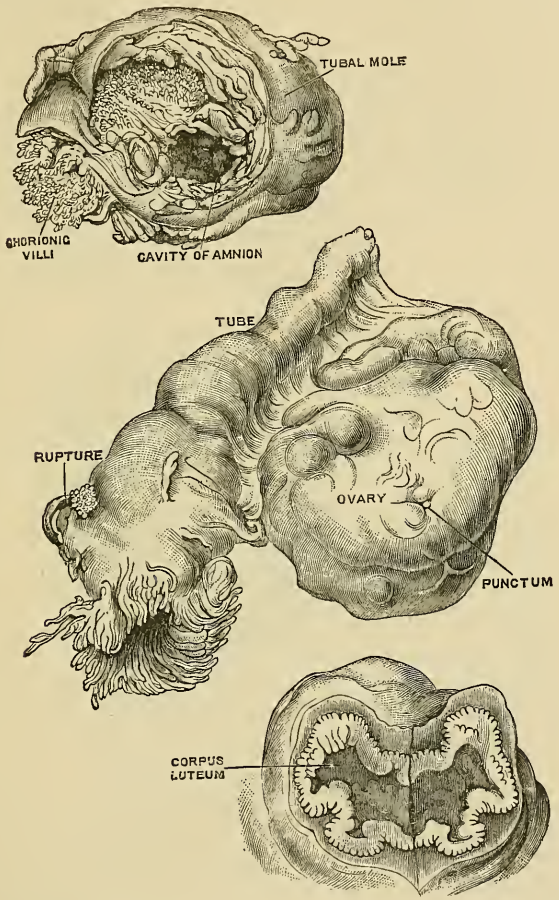

Fig. 115.—Fallopian Tube and Ovary, with the Mole and Corpus Luteum, from a case of "complete tubal abortion." Natural size.

tube and incomplete tubal abortion; the latter condition certainly gives rise to repeated bleeding. Besides this, the full recognition of the fact that a mole may be discharged through an unclosed ostium into the pelvic cavity has helped to complete the chain of evidence that pelvic hæmatoceles

have their chief source in hæmorrhages from gravid Fallopian tubes.

In tubal abortion the great danger lies in the fact that the bleeding is apt to be recurrent so long as the mole is

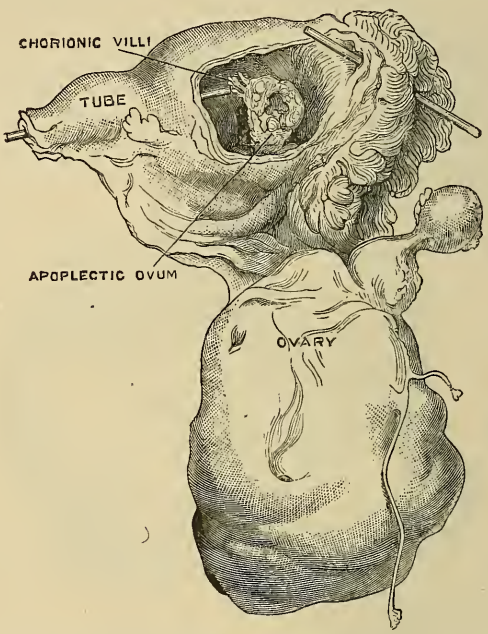

Fig. 116.—Gravid Fallopian Tube and Ovary. From a case of "incomplete tubal abortion." A portion of the tube has been cut away to show the mole *in situ*. Natural size.

retained in the tube. Noble has recorded briefly the details of a case of tubal abortion in which the blood-clots found in the pelvis were "coiled up much as though they had been ground through a sausage machine"; this was due to the blood clotting in the tube, and the clot was then forced out as a sausage-shaped mass by the continuance of the bleeding.

It is a noteworthy feature in many specimens of incomplete tubal abortion that the mole retains very firmly its attachment to the tube-wall (Figs. 114 and 116). This area of fixation corresponds to the placental site. In my early investigations into the nature of tubal moles I found that villi occurred abundantly in sections taken from one part, and yet were

almost absent in those taken from other parts of the same mole. After detecting the striking polar congregation of villi displayed in Fig. 113, I have since taken my sections from the adherent pole of the mole, and have so far never failed to find the villi in great force.

A specimen illustrating "incomplete tubal abortion" is shown in Fig. 116. I removed it from a woman twenty-six years of age. At the operation, the tube was full of thick fluid blood, and a large quantity was found free in the pelvic cavity; this blood had escaped from the tube through the unclosed ostium. Some delicate processes projecting from the small body within the tube were examined and found to be chorionic villi. The body and the mucous membrane

Fig. 117.—Tubal Mole in Section, under low magnification. The natural size of the mole is shown in Fig. 116.

Here and there, chorionic villi are seen in section.

to which it was attached were cut out, embedded, and sectioned for the microscope. It then became clear that it was a small tubal mole.

Its microscopic characters are sketched in Fig. 117.

The ovary of the opposite side was converted into a cyst. (*See* Fig. 77, page 131.)

An examination of museum specimens, supposed to be examples of hæmatosalpinx, demonstrates that tubal moles have many times been overlooked. The museum of St. Bartholomew's Hospital contains a specimen described as a "Hæmatoma of the Broad Ligament." The account in the catalogue runs

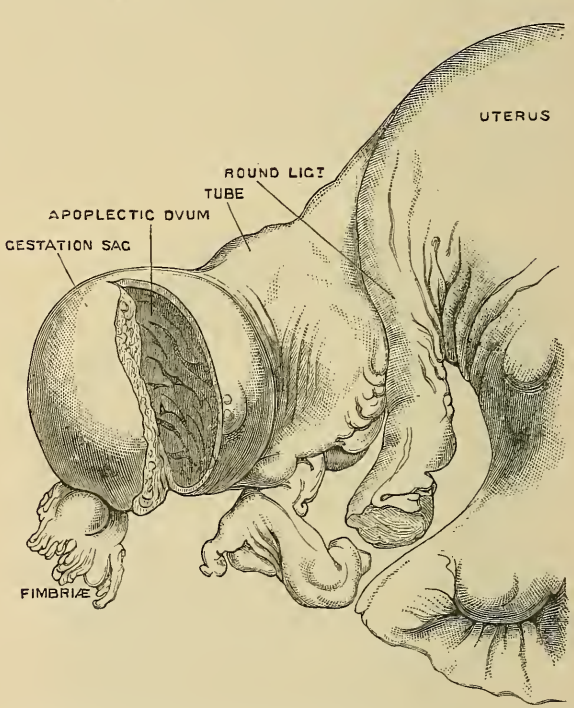

Fig. 118.—Left Fallopian Tube and adjacent Portion of the Uterus. (Museum, St. Bartholomew's Hospital.)
The tube is occupied by an apoplectic ovum or mole.

thus:—"The uterus and its appendages: between the layers of the right broad ligament is a globular cyst about as big as a walnut, the wall of which, in the recent state, was seen to be formed by the separated layers of the ligament; its cavity was filled with recent blood coagula (Fig. 118). On the anterior aspect of the cyst were two small, recently formed, irregular openings. From a patient twenty-five years of age, who,

while in the hospital for treatment of warts on the vulva, was suddenly attacked with the symptoms of internal hæmorrhage and died in twelve hours. At the *post-mortem* examination the cavity of the peritoneum contained five pints of recently effused, loosely coagulated blood; and dark fluid blood oozed slowly from the openings in the cyst above described. A very careful examination of the blood cyst failed to discover the source of the hæmorrhage. There was no evidence of the existence of uterine pregnancy, and no ruptured vessel was detected. It was uncertain whether the patient was menstruating at the date of the attack."

I obtained permission to examine this specimen, and found that the blood-clot was not between the layers of the mesometrium, but entirely within the tube; its histology showed clearly enough the supposed blood-clot to be a **tubal mole**, and that the woman was a victim of tubal pregnancy, which proved fatal about the fourth or fifth week.

CHAPTER XXXIII.

PRIMARY RUPTURE OF THE GESTATION SAC.

Abortion of a gravid tube, as described in the foregoing section, is a very common termination of tubal pregnancy. Failing this, the gestation sac almost invariably bursts, the only exception being the very rare event of a mole lying quiescent in the tube.

Rupture of the tube will be discussed in sections indicated in the subjoined table:—

I. Primary Rupture.
(*a*) Intra-peritoneal.
(*b*) Extra-peritoneal.

II. Secondary Rupture.
(*a*) Intra-peritoneal.
(*b*) Extra-peritoneal.

Primary Rupture.—This term refers to the rupture of the tube which, in the majority of cases, occurs at some period between the third and tenth week after impregnation, and is rarely deferred beyond the twelfth week.

The predisposing causes of rupture are the gradual attenuation of the walls of the gestation sac as the embryo grows, and the undue distension of the membranes by hæmorrhage. Muret * points out from a careful study of specimens that the walls of the gestation sac become particularly thin at the seat of implantation of the chorionic villi. Since reading his observations I have been able to verify them. Rupture is sometimes induced by violence, such as jumping from a train, stool, or carriage; straining during vomiting or defæcation; sexual congress, etc.

Before considering this event in detail we may for a moment study the relation of the Fallopian tube to the mesometrium. The healthy tube occupies the free border of this structure, and on two-thirds of its circumference is

* *Zeitsch. f. Geb. und Gyn.*, Bd. xxvi.

invested by it; indeed, the tube is held in possession by a peritoneal investment resembling the mesentery. The portion of the mesometrium adjacent to the tube is appropriately termed the mesosalpinx.

When the tube becomes distended by an embryo growing within it, the layers of the mesosalpinx are separated by the enlarging tube. This separation of the layers of the mesosalpinx, however, does not occur along the whole extent

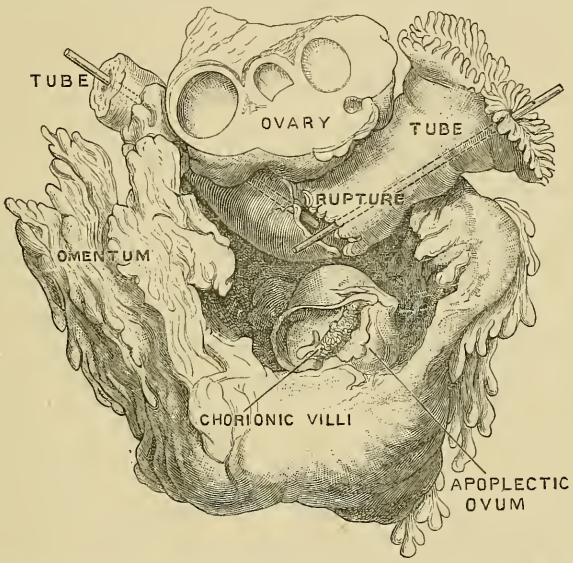

Fig. 119.—Gravid Fallopian Tube which burst early. The mole was caught and sequestered in a fold of omentum. The tubal ostium is widely dilated.
The history indicated that rupture had occurred many weeks previous to the removal of the tube. Patient recovered.

of the tube, but is restricted mainly to its middle third. It is important to realise this, because it explains the frequency of *intra-peritoneal* rupture when the embryo is situated in the *outer* and the *inner* segments of the tube. The anatomical evidence alone leads us to expect that when a pregnant tube bursts, the chances of this accident involving the serous covering would be greatly in excess of rupture through the uncovered portion, and as a matter of fact intra-peritoneal is to extra-peritoneal rupture in the proportion of three to one.

(*a*) *In primary intra-peritoneal rupture,* the embryo and its membranes, or a mole, accompanied by a variable amount

of blood, may be discharged directly into the pelvic cavity. The quantity of blood extravasated depends upon the date of rupture. When this occurs early, the blood extravasated may amount to less than a litre; but after the first month it is usually very copious, and frequently causes death in a few hours. When rupture is deferred until the seventh week, the embryo (or the mole) is not so constantly discharged through the rent, and as the walls of the gestation sac are prevented from contracting, the amount of blood which escapes is often very large.

When the hæmorrhage is moderate in amount and the patient escapes the immediate dangers incidental to the accident, especially shock, the effused blood may undergo partial absorption and recovery ensue (Fig. 119).

When the bleeding is not excessive, the blood collects in the recto-vaginal fossa and floats up the coils of intestines, and these, with the omentum, gradually form a covering to the fossa by adhering together, thus isolating the blood in the pelvis from the cœlom (peritoneal cavity). Unless hæmorrhage recurs the fluid portion of the blood is slowly absorbed and the patient recovers, but convalescence is very tardy.

Taylor has reported some valuable cases in which he demonstrates clearly enough that in some instances the blood undergoes coagulation in layers and forms a sort of spurious cyst. From what I have seen, the walls of these spurious cysts resemble the laminated arrangement familiar to surgeons in the parietes of a hæmatocele of the tunica vaginalis testis.

The dangers of primary intra-peritoneal rupture are:—

1. Rapid death from immediate hæmorrhage.
2. A fatal result may ensue from repeated hæmorrhage.

The disruptive force with which the effused blood separates the layers of the mesometrium is sometimes so great as to detach the Fallopian tube from the uterus. Such a case has come under my notice.

(*b*) *Primary extra-peritoneal rupture.*—In a fair proportion of cases the tube ruptures through that portion of its circumference lying between the separated layers of the mesosalpinx. When this happens the mole and a varying amount of blood are forced into the connective tissue between the layers of

the mesometrium (broad ligament). In most cases this is fortunate for the patient, as the bleeding is checked by the pressure exerted by the resistance which occurs when the mesometric tissues become distended, and is arrested before it assumes dangerous proportions. This is fortunate, for the blood and mole are sepulchred, as it were, in the mesometrium, and rarely cause subsequent trouble.

I have seen repeated bleeding into the mesometrium consequent on primary rupture, even when the oösperm has been converted into a mole, give rise to a hæmatoma reaching as high as the navel, and necessitate cœliotomy.

Rupture may take place, the embryo with its membranes remain uninjured and the pregnancy continue with advantage; for, no longer confined within the narrow limits of the tube, it begins to avail itself of the additional space thus offered, and burrows, as it grows, between the layers of the mesometrium.

According to the manner in which this mode of rupture is sometimes described, it might be imagined that the tube splits and the products of gestation are suddenly discharged from the tube into the mesometrium. This is not the case, or the pregnancy would, in every instance, come to an end from the dissociation of the fœtal from the maternal structures. As far as I have been able to study the morbid anatomy of the accident, the slow and gradual distension of the tube causes it to thin and gradually yield in that part of its circumference uncovered by peritoneum, until an opening forms, accompanied by sudden hæmorrhage, which produces collapse, the profundity and duration of which depend upon the amount of blood effused. This artificial opening gradually extends until the growing embryo and placenta make their way into, and by degrees occupy the new area of connective tissue opened up, unless the life of the embryo is terminated by renewed hæmorrhage.

When pregnancy continues in this way it is spoken of as "mesometric gestation," because the sac is formed in part by the expanded Fallopian tube and the layers of peritoneum forming the mesometrium.

Dezeimeris described the development of an extra-uterine

fœtus in this situation as far back as 1836; and Parry * draws attention to it thus:—

"By sub-peritoneo-pelvic (*sous-peritone-pelvienne*) pregnancy Dezeimeris intended to designate a variety in which the ovum, after quitting the ovarian vesicle, did not enter the Fallopian tube nor fall into the peritoneal cavity, but, on the contrary, passed between the two folds of the broad ligament and there developed. According to this view, the product of conception is situated outside the cavity of the peritoneum. That the ovum has been found in this locality cannot be doubted, but when such is the case there is every reason to believe that it reaches this peculiar situation through rupture of a tubal cyst, in which the integrity of the peritoneum was not destroyed; so that the ovum escaped between the two layers of the broad ligament, where it continued to develop. It is, therefore, one of the terminations of an ordinary tubal gestation."

Subsequent observation on this head has not only justified Parry's opinion, but demonstrated the fact that in all tubal pregnancies which survive the primary rupture and continue their development the gestation sac is formed in part by the expanded tube, but mainly by the layers of the mesometrium. The proper appreciation of this fact has done much to simplify our knowledge of tubal pregnancy; and no one has more strongly insisted upon its correctness than Lawson Tait.†

Berry Hart has reprinted Dezeimeris's paper, which was contained in an inaccessible publication.‡ A study of it makes it clear that his observation was of a very casual nature, and he certainly failed to appreciate its importance.§

* "Extra-uterine Pregnancy," 1876.

† "Ectopic Pregnancy," p. 32, 1888.

‡ *Journal de Connaissances Médico-Chirurgicales*, 1836.

§ Obstet. Trans. Edinburgh, vol. xviii. p. 233, and *American Journ. of Obstet.*, vol. xxix. p. 577.

CHAPTER XXXIV.

THE PLACENTA AND THE DECIDUA.

In tubal gestation the placenta is liable to many vicissitudes which influence very materially the life of the fœtus as well as that of the mother, and in many cases is such a source of anxiety to the surgeon that it is imperative upon those who may be called upon to deal surgically with tubal gestation, to consider the subject with more than ordinary care.

The formation of the *placenta in tubal gestation* differs in several particulars from one developed in the uterus. In normal gestation the uterine mucous membrane is supposed to take a large and important share in forming the placenta; but, as far as I can judge from my own observations, the tubal mucous membrane plays a very insignificant part when pregnancy occurs in the tube.

The fully-developed uterine placenta is composed of parts derived from the maternal and fœtal tissues, whilst a tubal placenta is mainly, if not entirely, derived from fœtal tissues.

Clarence Webster* has endeavoured to show that certain changes which he describes in the deep layers of the mucosa of gravid tubes represent a decidual formation. From a thorough, careful, and repeated microscopic examination of gravid tubes in exceptionally early stages of pregnancy I have failed to find anything that can be regarded as a tubal decidua—certainly nothing that is cast off in the form of a membrane, and this is an essential qualification for a decidua.

The Uterine Decidua.—It is a curious circumstance in tubal pregnancy that though no decidua forms in the tube, a decidua forms in the uterus. Few facts have been so disputed as this, and the discussions will be found in Parry's classical work. The conclusions of Parry have

* "Ectopic Pregnancy," 1895.

been confirmed by those who have studied the subject in recent years.

My own observations are so thoroughly consonant with Parry's that his views will be given in his own words:—

(1) "In all varieties of extra-uterine pregnancy a decidua forms in the uterine cavity, as in normal gestation, but none is found in the tube.

(2) "The decidua is rarely retained until the completion of gestation and thrown off during false labour. More frequently, if the patient goes to term, it is discharged during the early periods of pregnancy in small fragments, and without producing pain; or else it is expelled *en masse* with symptoms of miscarriage.

(3) "The absence of a uterine decidua when death has occurred from rupture of the cyst, even in the early stages of pregnancy, is not proof that the membrane has not been formed, but simply that it has been expelled before the death of the fœtus."

It is an interesting and curious fact that when pregnancy occurs in one half of a bicorned uterus, a decidua forms in the non-pregnant cornu. I have myself observed that

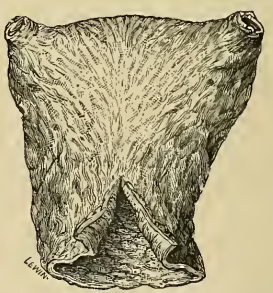

Fig. 120.—Uterine Decidua from a Case of Tubal Pregnancy. Natural size.

a similar condition holds good in animals normally possessed of bicorned uteri (*e.g.* Ungulates and Lemurs). In uterine pregnancy no decidua forms in the Fallopian tubes or in the cervical canal. It is now well established that the changes which occur in the mucous membrane of the genital tract in association with menstruation, are limited to that lining the cavity of the uterus, and the formation

of a true decidua is limited to that part of the genital tract.

It is important not to confound a decidua of pregnancy with a decidua occurring in what is called membranous dysmenorrhœa.

Menstrual Deciduæ rarely exceed 2 or 3 cm. in length

Fig. 121.—Surface Section of a Decidua. $\frac{100}{1}$. (After *Zweifel.*)

and are scarcely 2 mm. in thickness. As a rule, they are translucent, and rarely passed entire.

Deciduæ of Pregnancy are larger, and vary in thickness from 6 to 8 mm. They may be described as bags resembling in outline an isosceles triangle (Fig. 120). The base corresponds to the fundus of the uterus, and the apex to the internal opening of the cervical canal. At each angle of the triangle there is an opening. Those at the basal angles correspond to the Fallopian tubes, and the apical orifice to the cervical canal. The outer aspect is shaggy, and the inner surface is dotted with the orifices of uterine glands. The angle corresponding to the internal orifice of the cervical canal is often represented by a large opening.

The histology of a decidua is best studied in sections cut parallel with the surface, as in Fig 121. In this way the epithelium lining the ducts of the uterine glands is well

shown. The spaces not lined with epithelium are blood-vessels.

It is useful, for clinical purposes, to be familiar with the microscopic characters of deciduæ, because it happens that an early uterine abortion often simulates primary rupture of a gravid tube, and *vice versâ*. On examining shreds which have escaped from the vagina, one is able to decide by means of the microscope whether they are fragments of decidua, or chorionic villi from a uterine conception.

Up to the period of primary rupture the formation of the placenta has been proceeding in relation with the mucous membrane of the tube; but after this event, if the disturbance of the parts is not so great as to terminate the pregnancy, the course of events is modified in a remarkable manner.

We are indebted largely to the admirable investigations of Drs. Berry Hart and Carter for the facts upon which this account is based. After primary rupture of the tube, the embryo and placenta (when the development is sufficiently advanced) gradually occupy a sac formed by the expanded tube and separated layers of the mesometrium, the floor of this space being formed by connective tissue and the levator ani muscle.

The ultimate effects of this gradual dislocation of the embryo and placenta depend mainly upon the original position of the placenta. Dr. Berry Hart points out that when the embryo lies above the placenta, the latter becomes depressed downwards between the layers of the mesometrium until it is arrested by the pelvic floor. If, on the contrary, the embryo lies below the placenta, the embryo in its membranes burrows between the layers of the mesometrium, and the placenta is pushed up by the growing embryo until it lies high in the abdomen. He has had opportunities of investigating the structure of these extra-uterine placentæ, and points out that in tubal gestation the villi are embedded in decidual cells, and no intervillous sinus system seems to exist. Large sinuses, however, form in the muscular wall. The villi are well formed and covered with perfect epithelium (Fig. 122). The decidual cells are large, and have a big nucleus

and nucleolus. When the placenta is displaced into the mesometric tissue—and we must bear in mind that this

Fig. 122.—Villi from a Tubal Placenta in Transverse Section. Low magnification.

displacement occurs gradually—the placental structure becomes seriously damaged. The villi are less perfect in contour,

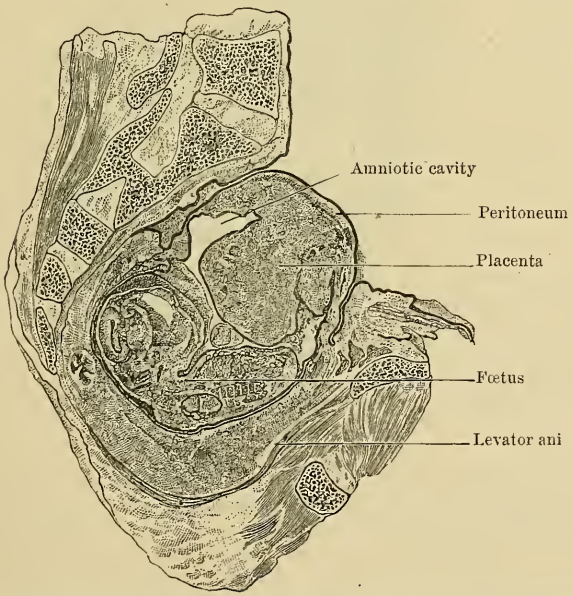

Fig. 123.—Sagittal Section of the Pelvis of a Woman with an Embryo and Placenta of the fourth month of Gestation occupying the Right Mesometrium. (After *Berry Hart.*)

extravasated blood is present, hæmic crystals are abundant, while the decidual cells are few and imperfect.

Dr. Berry Hart's observations lead him to conclude that the displacement of the placenta from mucous membrane to connective tissue gradually reduces the placenta to a mass of

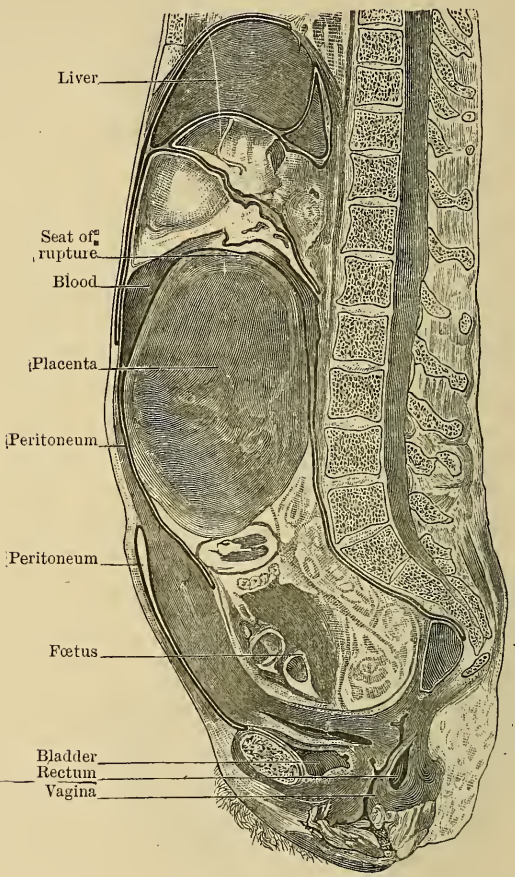

Fig. 124.—Sagittal Section of a Cadaver, with a Mesometric Pregnancy at term. It indicates the extreme displacement of the Placenta. (After *Berry Hart.*)

compressed villi, the serotina is destroyed and replaced by hæmic crystals and organising blood-clot. The least damage is sustained by the placenta when the embryo is situated above it, because under such conditions it undergoes the minimum amount of displacement. The extreme disorganisation to

which the placenta is liable when it forms the roof of the gestation sac may be studied even in the early stage of pregnancy (Figs. 123 and 124).

It must be obvious that a placenta when displaced in this way will have its functions very seriously hampered in comparison with one firmly deposited on the floor of the pelvis. It has been demonstrated histologically that there is great damage produced by this slow migration.

It is of the utmost importance to appreciate correctly the structural alterations which occur in the placenta consequent upon these remarkable displacements, as they exert a great influence on the subsequent history of the pregnancy, greatly imperilling the life of the mother, and being in most cases disastrous to the life of the fœtus.

The Danger to the Mother.—The constant tension to which the peritoneum covering the gestation sac is subject may at any time cause it to yield and lead to partial detachment of the placenta, and as a consequence severe hæmorrhage, which may take place into the gestation sac, or more probably into the cœlom. Such hæmorrhage in the late stages of these pregnancies is almost invariably fatal. Indeed, a woman with a mesometric pregnancy, with the placenta situated above the fœtus, runs a far greater risk of losing her life than when she is the victim of the dreaded condition termed *placenta prævia*.

The Effects of Placental Migration on the Fœtus.—We have seen already that tubal placentæ are less perfect organs than uterine placentæ. Even when a tubal placenta lies below the embryo after rupture, its structure is sufficiently damaged to render it an inefficient respiratory organ; hence it must be much less adequate for the needs of the fœtus when it is situated above the embryo, and subject to the grievous vicissitudes which have been already mentioned.

The results on the embryo are very manifest. A fœtus the product of a tubal gestation is a very unsatisfactory individual. Even when rescued by the surgeon at or near term, they rarely survive longer than a few days or weeks. In many cases they are ill-formed, and present hydrocephalus, club-foot, spina bifida, ectopia of the viscera, or

similar deformities; even when normal in shape they are exceedingly defective in size.

The unstable character of the life of a tubal child even when it survives extraction will be further considered on page 315.

Kirchoff * encountered two embryos in a tubal sac; they measured 11 cm. in length, and were united by a band in the thoracic region (thoracopagus).

Effects of the Death of the Fœtus on the Placenta.—It is a curious fact that many specimens have been described in which a tubal placenta has been large out of all proportion to the size or the age of the fœtus, and this has given colour to the suggestion that a tubal placenta may in some instances grow after the death of the fœtus.

Berry Hart † in 1892 collected the chief evidence supposed to support this view, and proved it to be untenable.

A large part of this chapter has been occupied in demonstrating the disastrous consequences which damage to the placenta exercises on the fœtus, yet the death of the fœtus involves the death and subsequent atrophy of the placenta. It has been shown repeatedly that when a tubal fœtus is in the condition of lithopædion there are no traces of its placenta.

* *Centralbl. f. Gyn.*, 1894, No. 10.

† *American Journ. of Obstet.*, 1892, vol. xxv.

CHAPTER XXXV.

SECONDARY RUPTURE OF THE GESTATION SAC.

When the pregnancy continues between the layers of the mesometrium, the gestation sac may at any moment rupture, and the risk of this accident, as far as can at present be judged, is much greater when the placenta is situated above the fœtus. As the pregnancy progresses the peritoneum forming the sac becomes stretched and stripped from adjacent parts, and from the viscera. Sometimes as the sac extends into the abdomen it will strip the peritoneum from the anterior abdominal wall, as in the case of an over-distended bladder, only to a much greater extent. When the serous membrane is stripped from the posterior aspect of the pelvis, the rectum may be deprived of its serous investment, as well as the posterior surface of the uterus, the fœtus and placenta insinuating themselves between these parts, beneath the peritoneum.

At any period between the twelfth week and term the gradually thinning gestation sac may rupture. The effects of this accident vary. When the rent involves the placenta, as is almost certain when this organ is situated above the fœtus, terrible hæmorrhage and speedy death are the usual consequences if the gestation has advanced beyond the mid-period of pregnancy; before this date the hæmorrhage may not always be so severe, and will afford opportunities for surgical intervention. When the blood bursts into the cœlom in this way it is spoken of as **secondary intra-peritoneal rupture.**

When the placenta occupies the pelvis, and the fœtus the abdominal portion of the sac, the latter may become so slowly thinned that at last it yields, and the fœtus is set free into the belly, and disports itself among the intestines.

It must be remembered that secondary rupture may be indefinitely delayed, and in some cases never occurs. The patient goes to term, passes through a *spurious* labour

the amniotic fluid is absorbed, the placenta disappears, and the existence of a tubal pregnancy never suspected until a mummified fœtus or a lithopædion is discovered at the autopsy. (*See* chapter xxxvi.)

Of the two forms of secondary rupture, the intra-peritoneal variety may occur at any date between the twelfth week and term. This form of rupture near or at term must be discussed more fully, because it is these cases which tend to perpetuate the belief that fertilised ova may tumble into the cœlom and engraft themselves upon the serous membrane and develop. A critical inquiry into this matter has convinced me that there is no case on record which can be cited as decisive proof of this occurrence. There is no such condition as a "primary abdominal pregnancy." *All forms of extra-uterine gestation pass their primary stages in the Fallopian tube.*

I am of opinion that the so-called primary abdominal pregnancies were originally tubal; gradually the tube opens out into the mesometrium, and as it progresses to term the walls of the gestation sac rupture, and the fœtus escapes into the belly, as in the remarkable case recorded by Jessop:—

A woman twenty-six years of age believed herself two months pregnant; she was suddenly seized with violent pain in the right side of the belly, which caused her to faint. From the effects of this trouble she kept her bed two months. Five months later, at a consultation, it was decided that she was a victim of extra-uterine gestation, and she was admitted into the Leeds Infirmary. As the woman was in a critical condition, cœliotomy was performed without delay. On cutting through the anterior wall of the belly, the breech and back of a child thickly coated with vernix caseosa came into view. The child had lodged in the midst of the bowels, free in the cavity of the abdomen. No trace of cyst or membrane could be discovered. The placenta was seen covering the inlet of the pelvis, like the lid of a pot, and extending some distance posteriorly above the brim, where it apparently had an attachment to the large bowel and posterior abdominal wall. The patient recovered from the operation, and the child lived for eleven months.

From this case nothing positive can be inferred, as fortunately the woman recovered, therefore the relation of the placenta to the gestation sac and the condition of the Fallopian tubes could not be ascertained.

Similar cases have been described by Champneys, Taylor, and others.

I have had one excellent opportunity of dissecting the pelvis of a woman who died after the removal of an extra-uterine fœtus which had escaped from the gestation sac among the intestines. I was able to isolate the displaced layers of the right mesometrium forming the gestation sac, in which a large piece of amnion was retained. The placenta had occupied the pelvis and part of the posterior wall of the uterus beneath the peritoneum. The corresponding tube and ovary were not detected. The age of the fœtus and circumstances of the case were identical with the cases of Jessop,* Champneys,† and Taylor.‡

* Trans. Obstet. Soc., vol. xviii. p. 261.

† *Ibid.*, vol. xxix. p. 456.

‡ *Ibid.*, vol. xxxiii. p. 115.

CHAPTER XXXVI.

RETENTION OF THE FŒTUS AND SECONDARY EXTRA-PERITONEAL RUPTURE.

In tubal pregnancy the life of the embryo is, as has been shown in the preceding chapters, very precarious. Yet in the face of all these possibilities the gestation may run on to term. Then symptoms of labour set in, and, as delivery by the natural channels is an impossibility, the gestation sac may rupture into the cœlom, with all the attendant evils. Escaping this catastrophe, the fœtus dies, and may remain quiescent or give rise to various forms of disturbance.

In the more fortunate cases the unavailing labour is followed by absorption of the amniotic fluid, and the tissues of the fœtus may become *mummified*, or partially calcified to form a *lithopœdion*; the soft parts may be converted into *adipocere*, or the tissues may *decompose*.

Mummification.—To produce this condition the fluid parts become absorbed and the soft parts are converted into dry tough tissue, so that the fœtus resembles a mummy, or the dried cats so commonly found under the floors of old dwellings.

The characters of such a fœtus are well shown in Fig. 125. It is almost completely developed, but compressed and dried, so that little more than the bones remain to indicate its previous form. It is reduced to a flattened irregular mass, about 10 cm. long and 5 cm. wide. The general form of the head and the outlines of its several bones, as well as some of the ribs, the forearms and hands, the knees, and parts of the lower extremities, are distinct; but the parts between them are shrivelled and partly calcified. The fœtus was removed by operation from the Fallopian tube (as it was believed) of a woman in whom it had been retained more than fourteen years beyond the ordinary period of gestation.

Adipocere is a peculiar substance intermediate between fat and wax; usually it is white in colour, and is chemically an ammoniacal soap, being formed by the union of a fatty acid with ammonia. The formation of adipocere depends therefore on the presence of fat, the ammonia being supplied by the decomposition of the tissues. Fully-formed adipocere

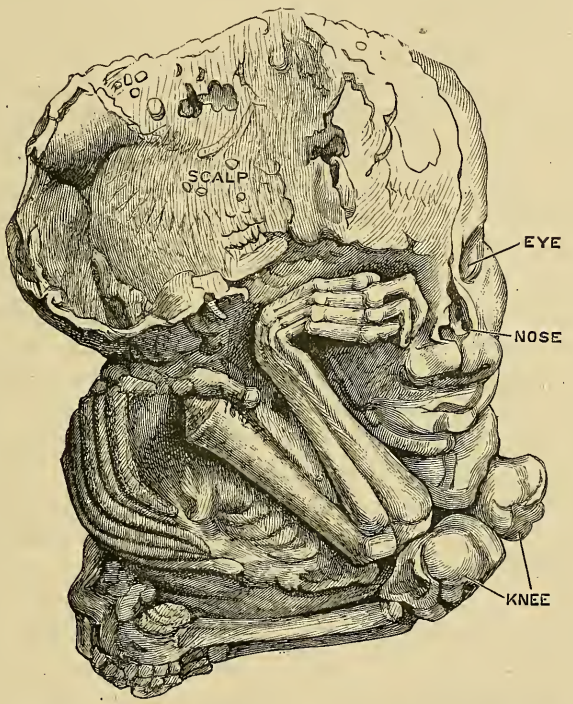

Fig. 125.—Lithopædion. (Museum, Royal College of Surgeons.)

is structureless, but unchanged tissue, such as fragments of muscle and bone, may be mixed with it. As the formation of adipocere depends upon the presence of fat, it naturally follows that it would occur easily in the fœtus, which at and near term contains a thick stratum of fat immediately beneath the skin. The presence of water is necessary for the formation of adipocere; hence this process takes place in bodies lying in damp soil or in water. Concerning the length of time necessary for this change to take place in dead bodies

we have no positive knowledge, but it requires at least a few months; it is probable that the encystment of a fœtus in soft and moist tissues between the layers of the mesometrium is a condition favourable for the formation of adipocere.

There is a circumstance in connection with these fœtuses, which are partially or wholly converted into adipocere, which is of some practical importance: this is the great tendency they exhibit to adhere to the walls of the gestation sac.

When a fœtus is converted, wholly or partially, into adipocere, or mummified, its superficial parts and the walls of the gestation sac are liable to become calcified. A fœtus encrusted with lime salts in this way is termed a **lithopædion.** In some specimens, parts of the fœtus are converted into adipocere, whilst other parts, even the internal organs, undergo calcification, or portions may be calcified and subsequently mummified.

The most remarkable case of retention of an extra-uterine fœtus on record is the one described by Cheston* in 1814. In 1738 a woman was taken in labour with her fourth child; the doctor in attendance declared it could not be delivered without the aid of instruments. To this the patient would not consent, declaring that rather than submit to instrumental delivery "she and the child should die together." The child did not come away, and the patient survived the incident fifty-two years, and died in 1790, at the age of eighty years. Before death she had arranged that the body should be examined. At the dissection a lithopædion was found in the pelvis. A portion of the specimen is preserved in the museum of the Royal College of Surgeons.

In 1881 Doran reinvestigated the specimen, at the suggestion of Dr. Robert Barnes.† He found the abdominal and thoracic viscera quite soft, but impregnated with lime-salts. The integuments and the subcutaneous tissues of the front of the thorax and abdomen are very thick and infiltrated with lime-salts, so as to feel gritty. The integument and subcutaneous tissues of the posterior part of the trunk are very thin, and converted into hard calcareous plates.

Dr. Barnes, in the same paper, drew attention to a similar

* Medico-Chir. Trans., vol. v. p. 104.

† "On the so-called Lithopædion," Trans. Obstet. Soc., vol. xxiii. p. 170.

specimen preserved in the museum of St. Thomas's Hospital. In this instance the specimen had been retained in the abdomen forty-three years. It was carefully investigated by Professor Charles Stewart. It has all the appearance of an embryo which had reached full development. It was doubled up and compressed into a ball enveloped in a sac, which fits so closely to its limbs, trunk, and head that no more than the general outline of the parts could be made out. This envelope consists of the cyst wall and membranes; the parts generally have undergone "adipocerous and cretaceous metamorphosis." The skin of the fœtus had also become calcified, and the deeper parts, including the viscera, were found more or less impregnated with lime-salts. The term *lithopœdion* does not signify that the fœtus is converted into stone, but that its tissues are impregnated with lime-salts—that is, *calcified.*

Secondary Extra-peritoneal Rupture. — Unfortunately, the majority of fœtuses sequestrated in the mesometrium do not remain quiescent, for the proximity of the intestinal tract leads to adhesion of the intestines, especially the rectum, to the sac wall, and in many cases the tissues dividing them become so thin that intestinal fluids and gases find their way into the sac and establish decomposition of the fœtal tissues and cause suppuration.

This is a matter of some interest, for it has been many times asked: How is it that in some cases a sequestered fœtus seems quite fresh, even after it has been dead for months, or remains innocuous as a lithopœdion, whilst in many it decomposes rapidly and becomes surrounded by pus? The answer is simple enough: so long as the fœtus is excluded from contact with air or intestinal contamination it is as safely preserved as a specimen in an air-tight jar, but as soon as air is admitted, or intestinal contents gain access to it, putrefactive changes at once begin.

The length of time a dead fœtus may remain *quiescent* in the mesometrium is, of course, impossible to determine; and though it may remain long enough to undergo conversion into adipocere, or even become a lithopœdion, it may, many years afterwards, decompose. Whether this event follows within a few weeks, or be delayed months, or perhaps years, the effects

produced by it are much the same. A collection of pus forms in the cavity, and, as in an abscess in the mesometrium arising from other causes, the pus attempts to find an outlet along the lines of least resistance. Thus it may open into the rectum; this would appear to be the most frequent direction. Often the pus will burrow through the walls of the vagina,

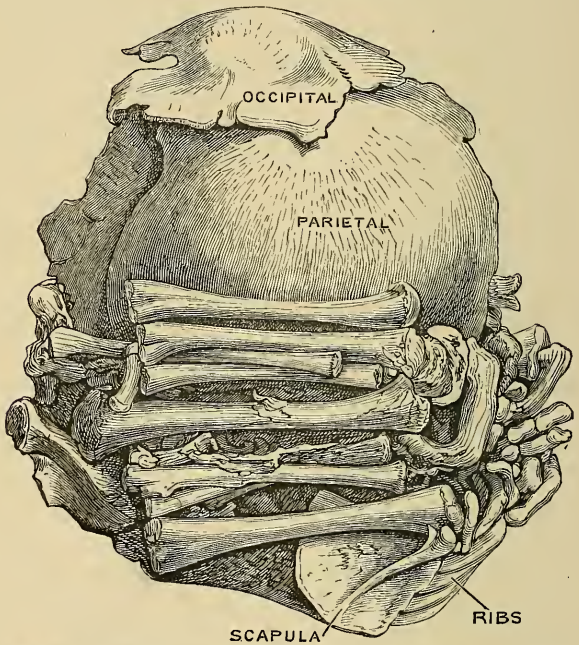

Fig. 126.—Mass of Fœtal Bones from a Case of Tubal Pregnancy. (Museum of the Middlesex Hospital.)
All the soft parts and the cartilages from the ends of the bones have decayed.

and not uncommonly makes its way into the bladder. Gervis * has recorded a case in which the abscess opened into the uterine cavity and the bones discharged through the cervical canal. Sometimes such abscesses present immediately above Poupart's ligament, and even point at the umbilicus. (*See* Sheild's remarkable case, page 318.) In whichever way they attempt to gain the surface, we find that a sinus forms, allowing the escape of pus, and sooner or later fragments of the fœtus, especially the shafts of the long

* Medico-Chir. Trans., vol. lxx. p. 35.

bones or portions of the vertebræ, appear at the opening. In some cases the discharge of pus, which at first is very free and offensive, gradually diminishes, and leaves a sinus which persists for years.

When such cases are examined after death, the old gestation sac is found firmly contracted on a conglomerate mass of fœtal bones, without the least particle of soft material, or even cartilage. Such a mass is sketched in Fig. 126. The specimen is preserved in the museum of the Middlesex Hospital.

An examination of these specimens shows that as the soft parts of the fœtus decay and are discharged, the walls of the sac gradually shrink upon and compress the skeleton; the bones of the arms and legs maintain the folded position assumed by them as the fœtus lies closely girt about by the sac in which it was developed.

When discussing the complications and combinations of tubal pregnancy, it was mentioned that women may conceive in the uterus after having conceived in the tube; that is, a woman may have a lithopædion or the macerated skeleton of a fœtus in the pelvis and yet conceive in her uterus. (*See* chapter xl.)

CHAPTER XXXVII.

TUBO-UTERINE GESTATION.

When an oösperm lodges in the section of the Fallopian tube which traverses the uterine wall and develops, the gestation is termed **tubo-uterine.** This variety (the *interstitial pregnancy* of former writers) runs a somewhat different course to the purely tubal form.

Tubo-uterine gestation is somewhat rare. Many specimens described as belonging to this class turn out, on critical examination, to be specimens of cornual pregnancy.

The occurrence of tubo-uterine gestation admits of no doubt; and fortunately, a few museum specimens of this accident exist which demonstrate its absolute independence of cornual pregnancy. Two specimens—one preserved in the museum of Guy's Hospital, and the other, which has had the advantage of careful investigation by Doran, in the museum of the Royal College of Surgeons—are the most satisfactory and easily accessible examples in London.

The specimen at Guy's is described in the Reports of that hospital for 1860 by Dr. Braxton Hicks. The dissection is thus recorded:—"Uterus enlarged to six inches long (15 cm.), and three and a half to four inches (10 cm.) in diameter at the widest part. A ragged rupture appeared on the fundus, rather towards the left side, from which blood had poured. The uterine walls had increased in thickness to about an inch and one-eighth (2·5 cm.) at the widest part.

"A cavity about three inches (7·5 cm.) in diameter (when collapsed) was situated in the substance of the wall of the fundus adjoining the left Fallopian tube. This cavity had extended the walls externally so as to be apparent there, and had also encroached on the cavity of the uterus, on the left side of the fundus. The walls of the cavity all round were formed of uterine tissue. The wall separating it from the uterine cavity was about one-sixth of an inch (5 mm.) in thickness. An examination of the specimen shows that the

cavity of the gestation sac is directly continuous with the tube. The walls of the sac bulge into the uterine cavity, which is lined by thick decidua" (Fig. 127).

In Doran's specimen the uterus was five inches (12·5 cm.) long from the fundus to the external os, and appears unsymmetrical, on account of the bulging of the cyst at its right upper corner. The uterine cavity was lined with decidua.

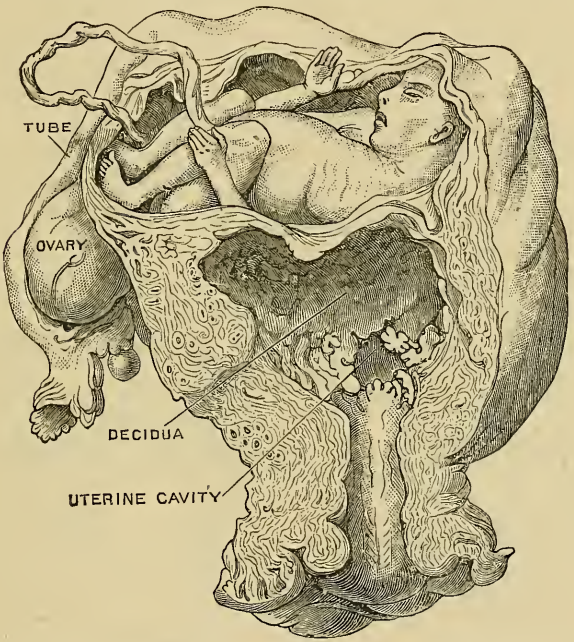

Fig. 127.—Tubo-uterine Pregnancy. (Museum, Guy's Hospital.)

The right side of the fundus is dilated and rent asunder by a long ragged aperture measuring two and a half inches (6 cm.) when unstretched. The cavity thus exposed measures one inch and a half (3·5 cm.) vertically, supposing the edges of the rent to be closed, and one inch (2·5 cm.) antero-posteriorly. The walls are very thin along the line of laceration.

Anteriorly the round ligament springs from the outer aspect of the exposed cavity, which bulges freely, at its lower aspect, into the upper part of the interior of the uterus. At

this part its walls are much thicker than above. The inner wall of the cyst is very rough, resembling to a certain extent an auricular appendix. From some of its numerous pits or depressions hang broken-off tags of chorion, but there is not a trace of a distinct decidua.

The right Fallopian tube passes into the outer and anterior aspect of the walls of the cyst, expanding slightly into a funnel-

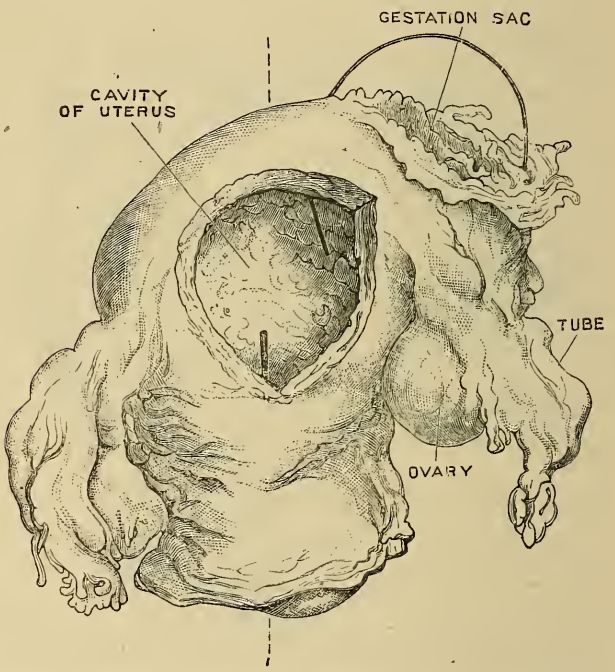

Fig. 128.—Tubo-uterine Pregnancy: the Gestation Sac ruptured at the end of the second month. (Museum, Royal College of Surgeons.)

shaped orifice, which opens into the cavity of the cyst, close to the rent in its walls. A stout bristle introduced into the tube from without passes readily into the cavity through the funnel-shaped orifice, which is lined with very smooth mucous membrane. On the outer surface of the portion of the cyst that projects into the uterine cavity is another funnel-shaped aperture with a smooth lining. A bristle passed from without through this opening enters the cavity of the cyst without the slightest obstruction (Fig. 128).

This uterus was obtained from a woman aged thirty-two years. She died in about ten hours after rupture of the cyst. An embryo enveloped in membranes and corresponding to the second month of development was found floating in blood in the abdominal cavity.

In 1895 I successfully operated on a patient twenty-two years old for primary intra-peritoneal rupture of a tubo-uterine pregnancy. The operation was undertaken within five hours of the onset of urgent signs, and a gutter-like rent, such as is represented in Fig. 128, was found. Menstruation was fourteen days overdue at the time of rupture. The uterus contained a very large decidua.

Tubo-uterine gestation differs in its course, anatomy, and modes of termination from the purely tubal form. In dealing with the anatomy of a gravid tube it was pointed out that as the gestation sac enlarged, its walls became thinned. In the tubo-uterine variety the walls of the gestation sac become greatly thickened, and this thickening extends to and involves the uterus. This hypertrophic condition of the walls of the sac explains the circumstance that whilst in the purely tubal form the sac ruptures very early—usually about the eighth week, and rarely deferred beyond the twelfth—in the tubo-uterine variety it may be delayed much beyond this date.

The date of rupture in four carefully authenticated cases is given in the subjoined table:—

Braxton Hicks *	The development had probably proceeded to the end of the fourth month.
Lawson Tait †	The patient thought she had turned the fourth month.
Doran ‡	About the end of the second month.
Author §	About the fifth week.

The sac of a tubo-uterine gestation may rupture in two directions. It may burst into the cœlom and be rapidly fatal, or into the uterine cavity and be discharged like an ordinary uterine conception. It is also an important fact to bear in mind that in this variety the sac does not rupture

* Guy's Hospital Reports, series iii. vol. vi. p. 275.

† "Ectopic Pregnancy," p. 46.

‡ Trans. Obstet. Soc. Lond., vol. xxiv. p. 227.

§ *Ibid.*, vol. xxxvii. p. 296.

in such a way as to allow of the embryo being dislocated between the layers of the mesometrium.

An examination of the clinical details of cases of undoubted tubo-uterine gestation indicates that intra-peritoneal rupture of the sac is more rapidly fatal than the tubal form; and this is due to the greater amount of hæmorrhage, because not only are the walls of the gestation sac thicker, but the rent often extends to, and even involves, the fundus of the uterus.

As a means of ready reference, the points in which the two varieties of tubal gestation differ from each other are arranged in tabular form:—

	TUBAL.	TUBO-UTERINE.
Frequency.	Very common.	Very rare.
Gestation sac.	Walls are very thin.	Walls very thick.
Termination.	(*a*) Intra-peritoneal rupture. (*b*) May rupture into the mesometrium. (*c*) May abort.	(*a*) Intra-peritoneal rupture. (*b*) May rupture into uterine cavity, and be discharged through vagina.
Date of rupture or abortion.	At any date from the 3rd to 12th week.	At any date from the 5th to the 20th week.

CHAPTER XXXVIII.

CORNUAL PREGNANCY.

Since Kussmaul demonstrated beyond dispute that many cases of supposed tubal gestation were really examples of pregnancy in a rudimentary cornu of a bicorned uterus, the subject has been carefully studied, and many descriptions of this accident have been placed on record.

In order to comprehend clearly the significance of bicorned uteri, we must briefly consider the development of the uterus.

In the mammalian embryo, at a very early date, two longitudinal tubes, known as Müller's ducts, lie on the dorsal wall of the abdomen. Each duct opens anteriorly into the cœlom, and posteriorly into the cloaca. These represent the oviducts of many fishes, all reptiles, and birds. In the male they usually atrophy, and only vestiges of them persist in the adult. In the human female these ducts approach each other and coalesce in their posterior two-thirds. For a time the cavities remain distinct, but gradually the septum atrophies and leaves a medium chamber, which communicates with the cœlom by two narrow ducts—the Fallopian tubes—and opens into the vagina by a single passage, called the cervical canal. The medium chamber is known as the uterine cavity.

During embryonic life the development of the uterus may be arrested in a variety of ways, and give rise to malformations of great practical interest.

The ducts may coalesce, but fail to communicate; each growing equally will produce what is termed a double uterus and vagina. This variety is termed *uterus duplex bicornis.*

In this form of uterus the recto-vaginal pouch is divided by a median fold of peritoneum into a right and left recess. In some specimens the fold will pass between the two halves of the uterus and divide the utero-vesical pouch.

In order to produce a normal uterus, the two Müllerian

ducts should be equally and fully developed. In some individuals one duct grows at a normal rate, whilst its fellow remains stunted, producing a unicorn uterus.

Unicorn uteri differ much in the degree to which the rudimentary cornu is developed. They are all similar in having the miniature cornu attached to its fully-developed fellow near the upper end of the cervix, and in the peculiar shape of the ovary which is attached to the diminutive cornu, for it is elongated, and resembles in shape a gherkin. The thickest part of these rudimentary cornua is near the attachment of the round ligament.

It would be far beyond the scope of this work to describe the morphology, pathology, and clinical import of malformed uteri; but the subject of tubal pregnancy cannot be discussed without some reference to cornual pregnancy, especially those cases in which it occurs in a rudimentary cornu. A full discussion of the subject would demand much time and space.

When pregnancy takes place in one horn of a well-formed bicorned uterus it goes on to full term, and ends as happily as if the organ were of normal shape. When one horn only is gravid—and this is the usual thing—the non-gravid half becomes much enlarged; in this it resembles the increase in size of the uterus when the Fallopian tube is occupied by an embryo, but there is this difference:—*In tubal pregnancy a decidual membrane forms, not in the tube, but in the uterus; in bicorned uteri the decidua is formed in the gravid cornu.* There is reason to believe that a decidua also forms in the non-pregnant cornu; this requires closer investigation than it has yet received in order absolutely to exclude the possibility of twin pregnancy.

The enlargement of both cornua when only one is impregnated is well shown in Fig. 129. The same condition may be studied in those mammals normally furnished with bicorned uteri.

Gestation in such uteri is rarely a source of trouble, but when an oösperm is lodged in the rudimentary cornu of a *unicorn uterus* it is often attended with disastrous consequences to the individual.

Kussmaul, in his classical work on "Malformations of the

Uterus "(1859), collected thirteen cases of what he regarded as pregnancies in the rudimentary cornua of unicorn uteri. In a few of the cases the original authors had recognised the

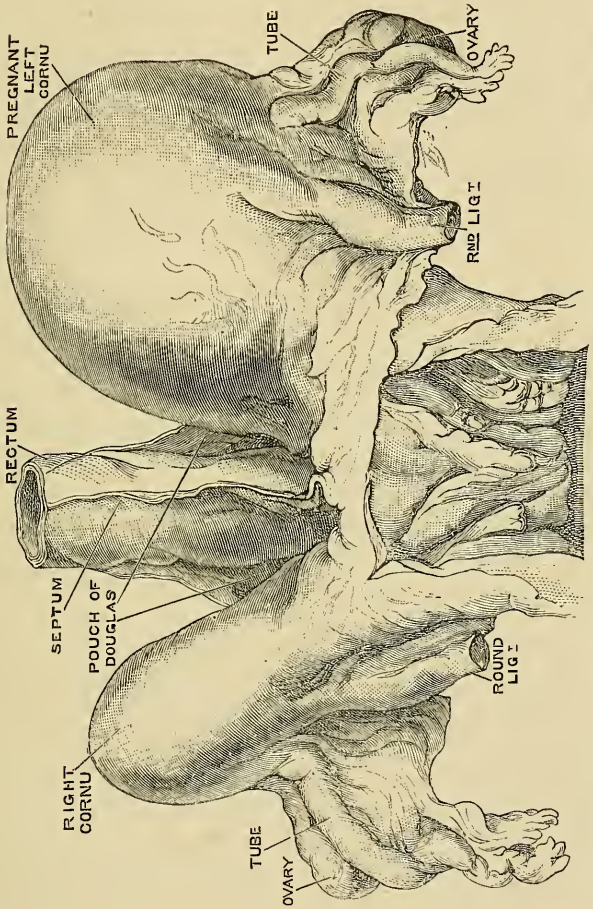

Fig. 129.—Bicornuate Uterus (*Uterus bicornis unicollis*) three days after Delivery, to show enlargement of both cornua, when one half is gravid. (Museum of St. Mary's Hospital.)

nature of the specimens, but the majority had been reported as tubal pregnancies.

Since the publication of Kussmaul's book a few examples of this condition have been placed on record. Of these, the most carefully described are those reported by Virchow, Luschka, and Professor Sir William Turner.

Virchow's case is of importance, because he points out a

useful means of distinguishing between a tubal pregnancy and gestation in a rudimentary uterine cornu, in regard to the insertion of the round ligament. The rules may be summarised thus:—

(1) In a *normal uterus* the *round ligament* springs from the upper angle, immediately in front of the tube.

(2) In *tubal gestation* the *round ligament* is attached to the body of the uterus, on the uterine side of the gestation sac.

(3) In *cornual pregnancy* the *round ligament* is situated on the outer side of the gestation sac.

Mauriceau* indicated as long ago as 1682 that the relation of the round ligament of the uterus to the gestation sac determined whether the sac was uterine or tubal.

Pregnancy in the rudimentary cornu of a unicorn uterus runs a different course to tubal pregnancy. In the case of the tube rupture (or abortion) usually occurs before the twelfth week, whereas in cornual pregnancy the gestation may go on to full term, and then ineffectual labour leads to the death and subsequent mummification of the fœtus; or the gestation sac may rupture at any period from the second to the ninth month.

There is reason to believe that a gravid uterine cornu may, in the human subject, undergo *axial rotation*. The accident is fairly common in the lower mammals. (*See* chapter xlii.)

It has been stated by writers on cornual pregnancy that the corpus luteum of pregnancy has been found in the ovary on the side opposite to the gravid cornu. To explain this it has been imagined that the tube reached across the middle line and grasped the opposite ovary; or the ovum, after leaving the gland, say of the left side, entered the tubal ostium of the right side. Such guesses do not call for serious consideration.

Pregnancy in one horn of a bicorned uterus sometimes gives rise to difficulty in diagnosis, mainly on account of the unilateral position of the gravid horn.

In the reported cases of mistaken diagnosis the error consisted in regarding the tumour as a uterine myoma.

* "Maladies des Femmes Grosses, etc.," 1682.

Angus Macdonald has described very fully a case of this kind which occurred in a woman twenty-three years of age. He believed the tumour to be a rapidly-growing uterine myoma. Acting on this opinion, abdominal section was performed. During the operation it was discovered to be a fœtus-containing tumour, and subsequently the nature of the case was clearly made out. The gravid cornu was amputated, and the patient made a good recovery. The fœtus had been dead several months.

Amand Routh has described a specimen of unicorn uterus in which a myoma had developed in connection with the undeveloped horn.

LITERATURE OF CORNUAL PREGNANCY.

Kussmaul's classical work, published in 1859, contains the more important cases up to that date. In British literature the following cases may be consulted:—Turner: *Edin. Med. Journal,* 1866, vol. xi. p. 971; Struthers: *Edin. Med. Journal,* vol. vi. p. 145; Routh: Trans. Obstet. Society, London, vol. xxix. pp. 2 and 58; Handfield-Jones: *Ibid.*, vol. xxix. p. 146; Remfry: *Ibid.*, vol. xxxvi. p. 263; Macdonald: Obstet. Trans. Edin., vol. x. p. 76.

In addition, consult also—Virchow: *Monatschrift für Geburtskunde,* 1860; Schröder: *Krank. der Weib Geschlechtorgane,* 1886; Luschka: *Monatsch. für Geb.,* 1863; Werth and Litzmann: *Arch. für Gyn.,* Bd. xvii. s. 281.

Remfry exhibited to the Obstetrical Society of London a gravid rudimentary cornu of a unicorn uterus which he had removed by cœliotomy from a single woman. The specimen was exceptional from the fact that the fœtus was represented by a compressed mass of bones as in Fig. 126, page 284.

CHAPTER XXXIX.

THE DIAGNOSIS OF TUBAL PREGNANCY.

The Symptoms of Tubal Gestation vary considerably, according to the degree to which gestation has advanced; it will therefore be necessary to deal with it in the following stages:—

(1) Before primary rupture or abortion.
(2) At the time of primary rupture or abortion.
(3) From the date of primary rupture to term.
(4) After term.

Before proceeding to discuss the signs which occur during each of these stages, it will be necessary to point out that the patient is sometimes aware that she is pregnant; in very many cases she is not aware of the fact, and the practitioner is often deceived by the absence of the usual signs of gestation—namely, fulness of the breasts and amenorrhœa. The breast signs are very variable in tubal gestation; in many cases they are absent even when the pregnancy has gone to the fifth month; in others the signs of pregnancy are as clear and as marked as in normal gestation. In one of my cases milk was present in one breast only, and that was on the same side as the gravid tube. Speaking generally, the absence of the usual signs of pregnancy do not negative the existence of tubal gestation; on the other hand, their presence is valuable, and may lead to a correct diagnosis.

Before Primary Rupture. — Gravid tubes have in a few instances been removed before *primary* rupture or *abortion*, but in nearly all the instances recorded before 1891 the operations were undertaken for the purpose of removing diseased tubes; examination of the tubes after removal has revealed the fact that they were gravid. Since this date the pathology of the early stages of tubal

pregnancy has been better understood, and a clear distinction recognised between a gravid tube and a hæmatosalpinx, and many cases have been recorded in which a correct diagnosis was made before the operation was undertaken (page 310).

This is very gratifying, and it is a matter of the utmost importance for the patient, as it spares her the awful peril which attends the rupture of the tube.

Primary Rupture.—In tubal gestation the sac *ruptures*, or *abortion* occurs, at some period before the twelfth week: the effect upon the patient depends on the seat of rupture. When it takes place between the layers of the mesometrium (broad ligament), the symptoms will, as a rule, be less severe than when the tube bursts into the cœlom, because the pressure exercised by the blood extravasated into the tissues of the mesometrium tends to check hæmorrhage, whereas the cœlom will hold all the blood the patient possesses, and yet produce no hæmostatic effect in the form of pressure.

The signs of intra-peritoneal rupture are those characteristic of internal hæmorrhage. The patient complains of a sudden feeling as "if something had given way;" this is followed by general pallor and faintness; the voice is reduced to a mere whisper; sighing respiration; depression of temperature; rapid and feeble pulse; usually vomiting, and in some cases death ensues in a few hours.

Should the patient recover from the shock, she will sometimes state that she suspected herself to be pregnant. The symptoms of rupture are often accompanied by hæmorrhage from the vagina, and shreds of decidua will be passed, so that the case resembles in many points, and is occasionally mistaken for, early uterine abortion.

Error in such circumstances may be avoided by examining the shreds discharged from the uterus; if they are found to be chorionic villi, the pregnancy is clearly uterine. This simple test has been useful to me on several occasions.

The rapidity with which the rupture of a gravid tube will sometimes destroy life has caused more than one writer to describe this accident as "one of the most dreadful calamities to which women can be subjected"; indeed, it

may be so rapidly fatal that many cases have been recorded in which death has been attributed to poisoning (Fig. 106), until dissection, instituted in many instances by the coroner, has revealed the true cause of death.

In 1880 a well-known English actress was taking an ice at a café in the Bois de Boulogne when she suddenly died. Poisoning was suspected, and the corpse was sent to the Morgue. At the autopsy the stomach and digestive organs were examined for poison. No traces of poison were found, but a gravid tube which had burst.*

An analysis of many careful records and inspections of specimens of gravid tubes demonstrate that the most dangerous cases are those in which the embryo or mole is lodged in the isthmus and in the uterine portion of the tube. Death sometimes follows rupture in three or four hours.

In some of the recorded cases rupture occurred soon after the patient retired to bed. On inquiry in one case I ascertained that sexual congress determined the rupture of the gestation sac.

It is important to bear in mind that the severe disturbance which is usually set up by primary intra-peritoneal rupture of a gravid tube is simulated by lesions of other abdominal viscera;—for example, perforating ulcer of the stomach, duodenum, small intestine, or vermiform appendix; rupture of a pyosalpinx; acute axial rotation of an ovarian tumour; acute intestinal obstruction; renal colic; and biliary colic when unaccompanied by jaundice.

On the other hand, the profound shock which usually accompanies the bursting of a gravid tube has been confounded with each of the above-mentioned lesions.

Malherbet† reports a case in which a woman thirty-four years of age was submitted to operation for supposed strangulated inguinal hernia. The sac was found filled with blood; the belly wall was freely incised and a gravid tube, which had burst, removed.

After Primary Rupture to Term.—From the third month onwards the *leading signs of tubal gestation* may be summarised thus:—

* Chahbazian: Trans. Obstet. Soc. London, vol. xxiv. p. 157.

† *Bull. de la Soc. Anat. de Paris*, tome ix., 1895, p. 3.

(1) *Amenorrhœa* is occasionally found; frequently there is hæmorrhage from the uterus at irregular intervals, accompanied by the escape of decidual membrane. *This is a valuable diagnostic sign when associated with the physical signs of a tumour outside the uterus.* It is even more valuable if the patient has missed one or two periods.

(2) There may or may not be milk in the breasts. Its presence is a valuable indication. From its absence nothing can be inferred.

(3) The uterus is slightly enlarged; the os is usually soft, as in normal pregnancy, and patulous.

(4) A large and gradually increasing swelling to one side and behind the uterus. Occasionally the fœtal heart can be heard, and in advanced cases the outlines of the fœtus may be distinguished.

(5) When a woman in whom the existence of tubal gestation is suspected is suddenly seized with collapse, and all the signs of internal bleeding, it is indicative of rupture of the gestation sac.

(6) Tubal pregnancy is very apt to occur after long intervals of sterility. (*See* page 243.)

After Term.—In spite of all the risks that beset the life of a tubal child and that of its mother, the pregnancy may go to term. Then a remarkable series of events ensues.

(*a*) Paroxysmal abdominal pains come on, resembling those of natural labour, accompanied by a discharge of blood and mucus from the uterus resembling the "show," and the os uteri dilates.

(*b*) This unavailing labour may last a few hours or days (it is stated to have lasted for weeks in some patients), and then subside.

(*c*) The mammæ may continue to secrete milk for several weeks.

These signs sometimes pass away, the amniotic fluid is absorbed, the swelling may diminish, and the retained fœtus causes no trouble. In the majority of cases suppuration takes place in the sac, the fœtus decomposes, and fragments of its tissues are discharged through fistulæ in the groin, abdomen, vagina, rectum, or bladder. It should be remembered that the onset of labour may rupture the sac.

In **extra-peritoneal rupture**—that is, when the tube bursts so that the blood is extravasated between the layers of the mesometrium—the symptoms resemble intra-peritoneal rupture, but as a rule are not so severe, and the signs of shock pass off quicker. On examining by the vagina, a round ill-defined swelling will be detected on one side of the uterus; when the effused blood is large in amount the uterus will be pushed to the opposite side. When the bleeding takes place into the left mesometrium (broad ligament) it will sometimes extend backwards under the peritoneum, and invade the connective tissue around the rectum, so that when the exploring finger is introduced into the rectum, a semi-circle —sometimes a ring—of swollen tissue will be felt encircling the gut.

The escape of decidual membrane from the uterus accompanied by blood is also an important and fairly constant sign. Occasionally it will be necessary to pass a sound into the uterus; the cavity of this organ will be found slightly enlarged when the tube is gravid and the os is invariably patulous.

The greatest difficulty in these cases is to be sure that the rupture is purely extra-peritoneal. In a few cases the rupture may also involve the peritoneal as well as the mesometric segment of the tube.

Not infrequently after primary extra-peritoneal rupture the symptoms of shock pass off, and the embryo continues its development; in many instances in which the patients believe themselves pregnant, the hæmorrhages from which they suffer and the signs indicative of the primary rupture may merely cause temporary inconvenience. As the embryo grows the abdomen increases in size; but the enlargement differs from uterine gestation in being lateral instead of median.

CHAPTER XL.

THE DIFFERENTIAL DIAGNOSIS OF TUBAL PREGNANCY.

THE diagnosis of tubal pregnancy is always beset with anxiety, which becomes intensified when complications exist. For instance:—

(1) Uterine and tubal pregnancy are sometimes concurrent.
(2) Uterine sometimes follows tubal pregnancy.
(3) Tubal pregnancy may be bilateral.
(4) Tubal pregnancy may be repeated.
(5) Tubal pregnancy and ovarian tumours occasionally co-exist.

It is also important to bear in mind that tubal pregnancy may be simulated by a variety of conditions:—

(1) Uterine pregnancy.
(2) Pregnancy in a bicorned uterus.
(3) Retroversion of the gravid uterus.
(4) Spurious pregnancy.
(5) Ovarian tumours.
(6) Tumours of the mesometrium.
(7) Uterine myoma.
(8) Fæces in the rectum.

Concurrent Uterine and Tubal Pregnancy.—Several examples of this combination have been recorded. In 1881 Dr. Galabin described such a case, which happened in a woman thirty-six years of age.

The history suggested an ovarian cyst complicated with pregnancy, and that the cyst had ruptured. A combined intra- and extra-uterine gestation was regarded as possible. Dr. Galabin* performed abdominal section. On opening the abdomen a fœtus was discovered enclosed in its membranes lying to the right side of, above, and somewhat behind, the uterus. The placenta appeared to be spread out

* Trans. Obstet. Soc., vol. xiii. p. 821.

very widely, and attached chiefly to the posterior surface of the right mesometrium and of the pregnant uterus. The placenta was not disturbed. Two days later labour pains came on, and the intra-uterine child was delivered; it was dead.

The patient continued to lose blood from the extra-uterine sac, and died three days after the operation. No autopsy was allowed.

Franklin * met with this combination in a woman, mother of five children. The patient was in labour when difficulty was experienced; Cæsarean section was performed, and an adventitious mass was detected in the pelvis. It was found to be an extra-uterine child. Death followed in half an hour. Similar cases have been reported by Cooke,† Sale,‡ Wilson.§ Other examples have been reported, but these illustrate the leading points in the clinical history of this accident. Its gravity is sufficiently obvious, for in all the reported cases the patients died within a few days of the operation. The great difficulty in this, as in all other examples of advanced tubal gestation, is the excessive risk of hæmorrhage which follows interference with the placenta.

Uterine subsequent to Tubal Gestation.—It has been mentioned that tubal gestation may go to term, spurious labour supervene, and the fœtus become sequestrated in the mesometrium. It is a fact that uterine pregnancy may supervene on this grave accident—a combination, fortunately for mothers, very rare.

Stonham‖, whilst conducting a *post-mortem* examination on a woman forty-three years of age who died in the seventh month of her pregnancy from bronchitis and ulceration of the trachea, found a fœtus (enclosed in a thick membrane) in the right mesometrium. Some of the bones were completely macerated; the soft structures were soapy in consistence. There was a thin deposit of calcareous material on the inner wall of the cyst. The left mesometrium was normal. *The*

* *Brit. Med. Jour.*, 1894, vol. i. p. 1019.

† Trans. Obstet. Soc., vol. v. p. 143.

‡ *American Jour. of Obstet.*, vol. xiii. p. 832.

§ *Ibid.*, vol. xiii. p. 821.

‖ Trans. Path. Soc., vol. xxxviii. p. 445.

uterus contained a seven months' fœtus, which was apparently living at the mother's death, since it showed no signs of maceration. Worrall,* of Sydney, published details of a case in which a woman with a fœtus in the mesometrium subsequently conceived in the uterus. The nature of the case was correctly diagnosed, and an operation for the relief of the condition was successfully carried out.

The patient was thirty years of age, and mother of five children. In April, 1888, the menses having been absent six weeks, she was seized in the night with severe abdominal pains, faintness, and vomiting. She was confined to her bed six weeks. In October of the same year, in about the eighth month of gestation, a sudden flooding, unaccompanied by pain, came on, and lasted three days. A month later she was seized with severe abdominal pains, which lasted a fortnight; she then began to decrease in size, and menstruation reappeared. The tumour diminished to a certain point and then remained stationary.

After July, 1889, she ceased to menstruate, and her abdomen gradually enlarged. A few months later Dr. Worrall was consulted, and he correctly recognised the presence of a living uterine fœtus and a tubal fœtus which had been dead about two years. Acting on this diagnosis, he removed the fœtus from the left mesometrium. It was not decomposed, but was very flaccid, and weighed 2 kilogrammes. The placenta was left, and the sac drained. Next day labour came on, and the uterine child was born. It was a female, and cried feebly, "but, in spite of every care, died in a few hours." The patient made a good recovery.

Bozeman† has recorded a case in which uterine supervened on tubal gestation. After delivery of the uterine fœtus an uneven and projecting mass presented in the recto-vaginal fossa. This proved to be the sac of a tubal pregnancy. From the history of the case it had probably been dead between three and four years. The contents of the sac were evacuated through the vagina. The patient recovered.

Bilateral (Concurrent) Tubal Pregnancy.—Several suspected examples of this rare condition have been recorded,

* *Med. Press and Circular*, 1891, vol. i. p. 296.

† *New York Med. Journal*, 1884, vol. xl. p. 693.

but in many the evidence was not convincing. In 1892 Dr. W. Walter sent me two Fallopian tubes which he had removed from a woman twenty-nine years of age. The left contained an embryo and placenta; the walls of the gestation sac had

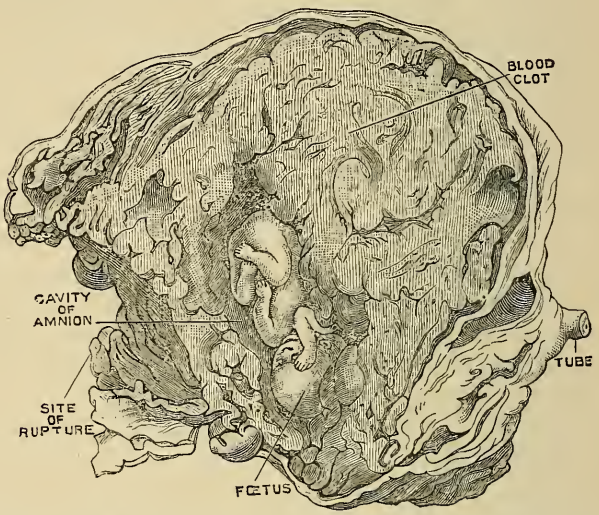

Fig. 130.—Gravid Tube from a Case of Bilateral (Concurrent) Tubal Pregnancy.

burst and caused severe bleeding, which led to operation (Fig. 130). The right tube contained a typical tubal mole (Fig. 131). This is, as far as I know, the first indisputable example of pregnancy occurring concurrently in both Fallopian tubes of the same individual.*

Repeated Tubal Pregnancy.—Under this heading it is usual to place those cases—fortunately rare—in which women have conceived in one tube, and have been submitted to operation; subsequently the remaining tube becomes gravid.

Herman has recorded a case of this condition; in January, 1887, he removed from a woman twenty-eight years of age a gravid right Fallopian tube which had burst into the cœlom. In May, 1890, the patient again came under observation for pelvic trouble, and Herman came to the conclusion that the woman was once more the victim of tubal

* *Brit. Med. Journ.*, 1892, vol. ii. p. 732.

pregnancy. Cœliotomy was performed and the left Fallopian tube was removed. It contained a tubal mole. The woman recovered.

Lawson Tait, in 1885, operated on a woman twenty-five years of age, and removed a gestation sac with the fœtus and placenta from the right side of the pelvis. This woman recovered, and eighteen months later was confined at term. Fifteen months after delivery she again became pregnant, and when the pregnancy had advanced, according to her computation, to the fourth month, she was seized with severe abdominal pain and died in five hours. At the *post-mortem* examination a tubo-uterine gestation was found on the left side.

Mackenrodt reported the case of a woman thirty-two years of age who was seized, in May, 1890, with signs indicating rupture of a gravid tube. These signs were repeated in October, 1891. The abdomen was opened, and a gestation sac the size of a large egg removed from the left side. On the

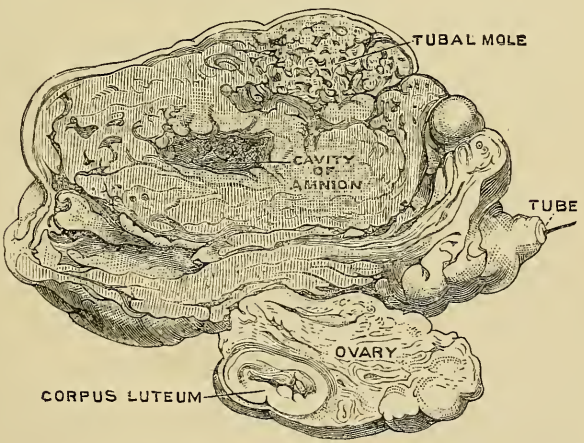

Fig. 131.—The Right Tube from a Case of Bilateral (Concurrent) Tubal Pregnancy.

opposite side a second sac was found containing fœtal bones.

Twin Tubal Pregnancy.—A few writers, especially Parry, deal with the subject of twins in tubal pregnancy as if it were a common event; but a critical

study of Parry's own writings shows clearly enough that he confounded three distinct conditions:—

(1) Concurrent tubal and uterine gestation.
(2) Uterine subsequent to tubal pregnancy.
(3) Twin gestation in a Fallopian tube.

Of true twin tubal gestation I am not acquainted with an undoubted case.

Tubal Pregnancy and Ovarian Tumours sometimes Co-exist.—Several instances have been recorded in which ovarian or parovarian cysts have co-existed with a gravid tube. In some cases a parovarian cyst has existed on the same side as the pregnant tube, and may perhaps have determined the accident. In a patient under my own care an ovarian cyst as large as a cocoanut existed on the right side, and a gravid tube (which had aborted) on the left. The ovarian cyst from this case is represented in Fig. 77, page 131, and the tube and mole in Fig. 116, page 260.

It is rarely that an ovarian tumour co-existing with uterine pregnancy simulates combined tubal and uterine pregnancy. In 1891 Dr. Griffith communicated to the Obstetrical Society details of a case in which a woman in labour came under his care; she was supposed to have twins, one tubal and the other uterine. It ultimately turned out that the patient was pregnant, and what was supposed to be the head of a tubal fœtus was a large fibroma of the ovary obstructing labour. She died, and the pelvis with the organs and tumour *in situ* was bisected; one-half of the specimen is preserved in the museum of the Royal College of Surgeons, the other in that of St. Bartholomew's Hospital, London.

Normal Pregnancy.—This has been mistaken for tubal pregnancy; the abdomen has been opened, the fœtus extracted, and the uterus amputated before the error was discovered.

Abnormal Thinness of the Walls of a Gravid Uterus.—Lawson Tait has drawn attention to some cases which have fallen under his notice in which the walls of the uterus were of such extreme thinness that the fœtus could be easily felt.

And in reference to one case he writes, "The child could be felt with most astonishing distinctness, and it floated about as if it were perfectly free in the abdomen." Some of the cases were regarded by the family physician in charge of them as abdominal pregnancies, that is, cases in which the fœtus was floating free among the intestines. There is also reference to a similar condition in Parry's well-known work. That this is a condition to bear in mind, the following case, furnished to me by a surgeon, well illustrates :—

A woman twenty-nine years of age was admitted into an infirmary in such an anæmic and emaciated condition that she was too weak to stand. There was vomiting ; amenorrhœa of six months' standing ; pigmentation along the linea alba, and milk in the breasts. The belly was distended, and the right iliac fossa lodged a crescentic mass not unlike a fœtus in outline, and so mobile that it could be pushed into the left iliac fossa. The remarkable ease with which this body could be grasped, and its position when at rest, led to the diagnosis of advanced tubal pregnancy, and an operation was decided upon. On incising the peritoneum a smooth glistening body of a pearly grey colour exactly like an ovarian cyst was seen, but it had the shape and occupied the position of the uterus. The fœtus could be felt and pushed about in the fluid with ease. The wound was at once closed. Miscarriage took place on the third day. The woman recovered.

In such cases when the diagnosis is so doubtful, before resorting to operation the employment of a uterine sound would easily determine the nature of the case.

Retroversion of the Gravid Uterus.—This has been a source of error. Retention of urine, so characteristic of this condition, is occasionally produced when the embryo occupies the mesometrium, accompanied by much hæmorrhage. On the other hand, *tubal gestation* has been mistaken for retroversion of a gravid uterus. Dr. Godson* relates a case which occurred in a woman who had been married thirteen years. A year after marriage she had one child. She remained sterile for twelve years, and then became pregnant. On account of inability to pass water she was admitted into St. Bartholomew's Hospital, and an ineffectual attempt

* Proc. Med. Soc. Lond., vol. vii. p. 390.

made to displace the swelling. Eventually Dr. Carter removed a fœtus from the mesometrium by abdominal section.

Spurious Pregnancy.—It is well known that in several instances the abdomen has been opened under the impression that the patients were suffering from tubal pregnancy, but nothing abnormal was found.

Sinclair Stevenson* reported a case of *spurious pregnancy simulating tubal gestation of the fourth month,* in which there was amenorrhœa. So strongly marked were the signs of tubal pregnancy that the abdomen was opened; instead of pregnancy, a small cyst of the ovary was found.

Tumours.—The difficulties which sometimes beset the differential diagnosis of pelvic swelling are shown by the fact that in very many instances cœliotomy has been undertaken to remove supposed ovarian tumours, dilated tubes, and the like, but the supposed tumours have turned out to be gestation sacs. This is no reflection on the surgeon, and more than justifies the interference.

Skene Keith† has briefly mentioned a case in which his father performed abdominal section, expecting to find a "fibroid tumour," but on cutting into it, a fœtus, which had been dead nearly two years, was found.

Knowsley Thornton and others have dissected out the sac, under the belief that they were dealing with tumours.

On the other hand, operations have been undertaken under the impression that the patients were victims of advanced tubal pregnancy, but tumours, and even a mass of fæces in the rectum, have been found instead.

Sir John Williams‡ writes: "I once saw a swelling which appeared to be a small ovarian cyst aspirated." It proved afterwards to be the placenta in a case of tubal gestation.

A very serious error is to mistake a tubal pregnancy in its mesometric stage for a sarcoma or myoma when the parts have been exposed by cœliotomy, as the operator, instead of opening the sac, attempts to remove the tumour, usually with a fatal result.

* Trans. Obstet. Soc., vol. xxxii. p. 216.

† Obstet. Trans. Edin., vol. x. p. 92.

‡ Trans. Obstet. Soc., vol. xxix. p. 490.

CHAPTER XLI.

THE TREATMENT OF TUBAL GESTATION.

The admirable results which have followed the treatment of tubal pregnancy by cœliotomy have served to establish this method on as secure a footing as ovariotomy.

Methods formerly advocated, such as killing the fœtus by injecting drugs into its body, or, more recently, by electricity and similar unsurgical procedures, are of such an unsatisfactory character that they will not be considered.

The risks and difficulties of an operation for tubal pregnancy depend mainly upon the extent to which gestation has advanced at the time the operation is performed. The operative treatment may be considered in the following stages:—

(1) Before primary rupture, or abortion.
(2) At the time of primary rupture, or abortion.
(3) Subsequent to rupture.
(4) When the embryo and placenta occupy the mesometrium.

The fourth stage will be required to be considered in sections, thus:—

(*a*) At, or near term; the child being alive.
(*b*) At, near, or after term; the child being *dead, mummified*, or in the condition of a *lithopædion*.
(*c*) After decomposition of the fœtus.

(1) **Before Primary Rupture or Abortion.** — Opportunities of dealing with cases in this stage are uncommon, as gravid tubes rarely cause trouble before they rupture or abort. Nevertheless, the widespread interest now displayed in regard to tubal pregnancy has led to the detection of gravid tubes in the early stages, and Herman's case (1890) is no longer an isolated example of clinical acumen, but a goodly list of instances can be furnished in which early tubal pregnancy has been diagnosed and the gravid tube removed before it has burst or aborted.

Results.—I have appended a list of cases coming under this heading. In each instance the patients recovered.

Herman	... *Brit. Med. Journal*, 1890, vol. ii. p. 722.
Taylor	... *Jour. Brit. Gyn. Soc.*, vol. viii. p. 168.
Mansell-Moullin	... *Ibid.*, vol. x. p. 506.
Cleghorn	... *Ibid.*, vol. viii. p. 193.
Lewers	... *Lancet*, 1895, vol. i. p. 858.
Schacht	... Trans. Obstet. Soc., vol. xxxvi. p. 5.
Duncan	... *Ibid.*, vol. xxxvii. p. 197.
Remfry	... *Ibid.*, vol. xxxvii. p. 287.
Cullingworth	... St. Thomas's Hospital Reports, vol. xx. p. 141.
,, ...	... *Ibid.*, vol. xxii. p. 449.
,, ...	... "Diseases of the Fallopian Tubes," p. 52, plate xii.

(2) **At the Time of Primary Rupture or Abortion.**—The majority of cases of tubal pregnancy come under observation at the time of primary rupture or abortion, and this is usually some period between the fourth and twelfth week.

When the symptoms of hæmorrhage are unmistakable and the patient's life in grave danger, cœliotomy should be performed without delay, unless there is good evidence that the rupture is extra-peritoneal. The employment of this method is in strict accordance with the canon of surgery valid in other regions of the body, namely, arrest hæmorrhage at the earliest possible moment.

There are few accidents that test the skill, nerve, and resource of a surgeon more than cœliotomy for a suspected intra-peritoneal rupture of a gravid tube, and few operations are followed by such brililant results.

The method of performing the operation before and at the time of primary rupture is identical with oöphorectomy.

Occasionally the rent in the tube will involve the fundus of the uterus, especially when the embryo is lodged near the uterus. Such rents should be carefully sutured with cat-gut.

(3) **Subsequent to Primary Rupture.**—The majority of cases are submitted to operation at periods varying from a few days to weeks, or even months, after the tube has ruptured. It has been already pointed out that in an exceedingly large proportion of cases the tube is occupied by a mole.

When the tube ruptures the bleeding is not always so profuse as to induce death, and the patient, recovering from the shock, does not manifest such grave symptoms as to

demand surgical aid. The consequence is that the patient remains for several weeks under palliative treatment (unless a renewal of bleeding kills her), and at last she seeks surgical advice; appreciation of the true nature of the case leads to operation.

In such cases, when the abdomen is opened the free blood in the abdominal cavity is easily washed out by a stream of warm water. The damaged tube and ovary are removed as in oöphorectomy. When there is much free blood care must be taken that no clots are allowed to remain in the iliac fossæ. When the blood has remained in the cœlom for several weeks after rupture, it is invariably necessary to drain.

The cases in which abortion or rupture of gravid tubes gives rise to intra-peritoneal bleeding, moderate in amount and insufficient to cause symptoms which directly threaten life, are those in which the effused blood is confined to the cavity of the pelvis by adhesions of intestines and omentum as explained in the section dealing with primary intra-peritoneal rupture (page 266).

Experience has not yet decided whether it is safer for the patient under such conditions to run the risks of immediate operation or to wait for a few weeks in order to ascertain if absorption will occur. At present, I believe the patient's interests are best served by allowing her to recover from the shock and then dealing with the damaged tube by cœliotomy.

Result.—It is difficult to estimate the risks of operation at this stage because the period at which interference is needed after primary rupture varies from a few hours to six weeks. Within these limits the mortality in experienced hands is under 10 per cent.

(4) **Broad Ligament (Mesometric) Gestation.**—When the tube bursts between the layers of the mesometrium immediate operative interference is rarely necessary. In a small proportion of cases the embryo survives the accident and continues to grow.

At any date from this period up to term, surgical interference may be called for to save the patient from the disastrous effects of secondary intra-peritoneal rupture.

When gestation has not advanced beyond the fourth month, it is possible to remove the embryo, tube, ovary, and

adjacent portion of the mesometrium with the placenta, and to thoroughly remove all blood-clot.

When gestation has advanced beyond the fourth month the placenta has become too large to be dealt with in this summary manner; at the same time, the sac has encroached upon the peritoneum belonging to adjacent organs, such as uterus and rectum, bladder and not infrequently the anterior wall of the abdomen.

After the fifth month operative measures for tubal gestation must be considered under two headings:

(1) The Treatment of the Sac;
(2) The Treatment of the Placenta.

(1) **The Treatment of the Sac.**—The gestation sac in the last stages of tubal pregnancy consists of the remnants of the expanded tube and the mesometrium, which may be thickened in some parts and attenuated in others. To the walls of the sac coils of intestine and omentum usually adhere.

The removal of such a sac is fraught with considerable risk, not only to the adjacent large blood-vessels, but to the viscera and ureters. Nevertheless, in spite of the great risk of such a proceeding, it has on one occasion been successfully accomplished, and the patient happily recovered.* It will generally be found that in cases where attempts have been made to dissect out the sac, the operation was begun under the impression that the abnormal mass was a tumour.†

Experience has decided clearly enough that the safest plan is to incise the sac, remove the fœtus, and stitch the edges of the sac to the abdominal wound, precisely as in the plan recommended after enucleating large cysts and tumours from between the layers of the mesometrium.

In those cases where the gestation has well advanced, the peritoneum may be so stripped from the anterior abdominal wall that the sac can be penetrated without intentionally opening the peritoneal cavity (cœlom) at any stage of the operation.

* Thornton: Trans. Obstet. Soc., vol. xxiv. p. 81.

† Doran: *Ibid.*, vol. xxix. p. 491.

(2) **The Treatment of the Placenta.**—This is a perplexing matter; there can be no doubt that the situation of the placenta largely influences the result, and as far as I can judge from the reports of cases, as well as from my own experience, the most promising cases are those in which it is situated in the pelvis, below the fœtus.

When the placenta is situated above the fœtus it will, in many cases, be incised as the sac is opened, and give rise to such furious bleeding that in several cases the patients have succumbed to the hæmorrhage. Even prompt seizure and ligature of the pedicle on the uterine side of the sac fail to arrest the bleeding; in such a case the abdominal aorta must be compressed.

Various methods, such as packing with sponges and the application of perchloride or persulphate of iron to the bleeding surfaces, have been adopted, and in a few instances with success.

The fear of such hæmorrhage and its uncontrollable character has induced several surgeons to adopt the alternate plan of leaving the placenta, and allowing it to gradually slough away, taking care, of course, to keep up free communication with the exterior.

The disadvantages of this method are many. The process of suppuration and discharge of the placenta is long and dangerous, on account of the great risk the patient runs of septicæmia and peritonitis; in a large proportion of cases a fæcal fistula forms; in the majority of cases, however, such fistulæ gradually close as the patients convalesce.

In order to avoid this risk, attempts have been made, after removing the fœtus, to irrigate the gestation sac thoroughly, to tie the cord close to the placenta without disturbing the latter, cautiously to sponge the cavity and then to hermetically close it, in the hope that the placenta will atrophy.

Unfortunately for this method, there is another source of infection to reckon with. It has already been mentioned that as the gestation sac enlarges it frequently strips the peritoneum from the rectum, and the placenta itself may acquire adhesions to the bowels. The result is that micro-organisms

from the intestines gain access to the placenta, and set up decomposition.

With our present experience, the rules for the treatment of the placenta may be formulated thus:—

(1) When the placenta is situated above the fœtus it is good practice to attempt its removal.
(2) In some instances the placenta becomes detached in the course of the operation, and leaves no choice.
(3) When the placenta is below the fœtus, it may be left.
(4) Should the placenta be left, the sac closed, and symptoms of suppuration occur, then the wound must be reopened and the placenta removed.
(5) If the fœtus dies before the operation is attempted, the placenta can be removed without risk of hæmorrhage.

Could we feel sure that the placenta would not decompose, the best method would be to close the sac hermetically and leave the placenta to atrophy, or wait until we know that the placental circulation has ceased, then reopen the sac and take out the placenta. Unfortunately, we have no precise data to guide us in this respect, and whilst waiting for the placenta to die its tissues decompose.

Apprehension that the placenta may grow after the fœtus has been removed is absolutely groundless, and there is positive evidence that if it does not decompose it quickly and completely atrophies. This is further proved by the absence of the placenta when the fœtus is in the condition of lithopædion.

The great risk of violent hæmorrhage renders an operation for tubal pregnancy with a quick placenta between the fifth and ninth months of gestation, the most dangerous in the whole range of surgery; hence it cannot be urged with too much force that *when it is fairly evident that a woman has a tubal pregnancy, it should be dealt with by operation without delay.*

It has been urged that if after *primary* rupture there is evidence that the child is developing, operative interference should be deferred until the seventh month, unless urgent symptoms arise, as there may be a prospect of

saving the child's life. To my mind, this is an objectionable practice, for the following reasons :—

(1) Tubal children are puny, ill-developed, and in a large proportion of cases malformed (page 275).

(2) They rarely survive extraction many weeks, at most months.

(3) In endeavouring to save the life of an unsatisfactory child, the more valuable life of the mother is frequently sacrificed. Compare tables on pages 315 and 317, which have been compiled for this purpose.

It is, of course, conceivable that in some very exceptional case the life of the child may be of great importance.

TUBAL GESTATION.

CŒLIOTOMY BETWEEN THE SEVENTH AND NINTH MONTH—THE CHILD BEING ALIVE.

OPERATOR.	DATE OF PREGNANCY.	TREATMENT OF PLACENTA.	RESULT TO MOTHER.	RESULT TO CHILD.	REFERENCE.
Heywood Smith	36 wks.	Removed	D.	Lived 30 mins.	Trans. Obstet. Soc., vol. xx. p. 5.
Jessop .	33 wks.	Left to slough	R.	Lived 11 mnths.	Trans. Obstet. Soc., vol. xviii. p. 261.
Gervis .	Term	Left to slough	D.	Lived 6 hrs.	*Ibid.*, 1877, vol. ii. p. 884.
Champneys	28 wks.	Left to slough	D.	Lived a few hrs.	Trans. Obstet. Soc., vol. xxix. p. 456.
J. Williams	34 wks.	Left to slough	R.	Lived a few hrs.	*Ibid.*, vol. xxix. p. 482.
Taylor .	Term	Left	R.	Lived 5 mnths.	*Ibid.*, vol. xxxiii. p. 115.
Stevenson .	32 wks.	Removed	R.	Lived 2 days	*Ibid.*, vol. xxxv. p. 176.
Pearce Gould	32 wks.	Left	D.	Lived a few mins.	Middlesex Hosp. Report, 1890, p. 175.
Handfield-Jones	32 wks.	Left	D.	Lived ? 3 mnths.	*Lancet*, 1895, vol. ii. p. 972.
Galabin .	Term	—	D.	Lived a few mins.	Trans. Obstet. Soc., vol. xxxv. p. 182.
Donald .	Term	Removed	D.	Never breathed	Unpublished.
Culling-worth	Term	Left	D.	Lived 11 mnths.	*Brit. Med. Journ.*, 1894, vol. ii. p. 1422.

Harris* and Champneys† have dealt with this question

* *American Journal of the Med. Sciences*, 1838.

† Trans. Obstet. Soc., vol. xxix. p. 476.

from a much larger series of cases. I have confined myself entirely to the records of British surgeons, with the hope that some industrious authors in America, France, and Germany will furnish similar returns, gathered from cases reported in the periodical literature of these countries during the last ten or fifteen years. This would provide a trustworthy basis for guidance in this important matter, and enable authors to obtain without undue difficulty the history of those children which survive surgical delivery.

After Death of the Fœtus at or near Term.—Operations after the death of the fœtus are less complicated than when it is alive and the placental circulation in full vigour. Not only is the proceeding from the operative point of view simplified, but the results, in so far as the mother is concerned, are much more satisfactory.

When the operation is undertaken in cases where the fœtus is in the condition of *lithopædion*, the procedure is very simple because the placenta has completely disappeared.

When the fœtus is converted into adipocere, the fœtal tissues adhere to the walls of the sac and render the process of removal tedious.

After Decomposition of the Fœtus and Suppuration of the Sac.—After death and decomposition of the fœtus, sinuses form, by which pus finds an exit, either through the rectum, vagina, bladder, uterus, or at some spot in the anterior abdominal wall below the umbilicus, accompanied by fragments of fœtal tissue and bones. The treatment in such cases is simplicity itself. The sinuses should be dilated, and all fragments removed from the cavity in which they lie. When this is thoroughly done, the sinuses will rapidly granulate and close. Partial operations are useless; if only a portion of a bone is allowed to remain, a troublesome sinus persists.

The difficulties and grave dangers which surround surgical intervention in the late stages of tubal pregnancy, make it clear that the interests of patients are best served when the surgeon removes a gravid tube as soon as it is clearly recognised.

TUBAL GESTATION.

CŒLIOTOMY AFTER DEATH OF THE FŒTUS, AT OR NEAR TERM.

OPERATOR.	LENGTH OF TIME AFTER DEATH OF FŒTUS.	TREATMENT OF PLACENTA.	RESULT.	REFERENCE.
Braithwaite .	2 wks.	Left to slough	R.	*Lancet*, 1885, vol. i. p. 7.
Braithwaite .	1 mnth.	Left: removed 6 wks. later	R.	*Ibid.*
Braithwaite .	3 wks.	Left: it never came away	R.	Trans. Obstet. Soc., vol. xxviii. p. 33.
Braithwaite .	1 mnth.	Removed	R.	Unpublished.
Braithwaite .	2 mnths.	Left	R.	Unpublished.
Braithwaite .	2 mnths.	Left	R.	Unpublished.
Sir J. Williams	4 mnths.	Left	R.	Unpublished.
Sir J. Williams	12 mnths.	Left	R.	Unpublished.
Savage . .	6 wks.	Left	R.	Unpublished.
Savage . .	3 wks.	Left	R.	Unpublished.
Herman . .	2 mnths.	Removed	R.	*Ibid.*, vol. xxviii. p. 141.
Herman . .	5 mnths.	Removed	R.*	Unpublished.
Cullingworth .	8 mnths.	Removed	R.	*Ibid.*, vol. xxx. p. 480.
Cullingworth .	3 wks.	Removed	R.	*Ibid.*, vol. xxxv. p. 155.
Cullingworth .	4 mnths.	Left	D.	*Obstet. Journ. Gt. Brit.*, vol. iii. p. 660.
Cullingworth .	? wks.	Removed	D.	*Clin. Journ.*, vol. v. p. 347.
Cullingworth .	8 wks.	Removed	D.	*Ibid.*
Lawrence .	4 wks.	Left	D.	*Bristol Med.-Chir. Journ.*, 1892, p. 75.
Lawrence .	6 wks.	Left	R.	*Ibid.*
Bond . .	2 mnths.	Removed	D.	Unpublished.
Greig Smith .	5 mnths.	Left	R.	"Abdominal Surgery," 1891, p. 343.
Worrall . .	15 mnths.	Left: no subsequent note	R.	*Med. Press and Circular*, 1891, vol. i. p. 296.
R. Morison .	1 wk.	Left: no subsequent note	D.	Unpublished.
Sheild . .	—	Removed	R.	Trans. Obstet. Soc., vol. xxxiii. p. 148.
Lawson Tait .	16 wks.	Removed	R.	*Ibid.*, vol. xxxiv. p. 192.
S. Turner .	3 wks.	Removed	R.	*Ibid.*, vol. xxxv. p. 179.
Taylor . .	12 wks.	Left: came away in 4 wks.	R.	*Journ. Brit. Gyn. Soc.*, vol. viii. p. 168.
L. Napier .	12 wks.	Removed	R.	*Journ. Brit. Gyn. Soc.*, vol. vii. p. 362.
Oliver . .	16 wks.	Removed	R.	*Brit. Med. Journ.*, 1891, vol. ii. p. 1309.
Carter . .	? wks.	Removed	R.	Unpublished.
Galabin . .	? mnths.	Left	R.	Trans. Obstet. Soc., vol. xxxv. p. 182.
Horrocks .	4 mnths.	Removed	R.	*Ibid.*
Horrocks .	—	Removed	R.	*Ibid.*
Thornton .	6 yrs.	No placenta	R.	Unpublished.

* Died three months afterwards from chronic suppuration of bladder and kidneys due to a tear in the ureter.

Mr. Sheild's case was somewhat remarkable. It occurred in a young married woman who had been for many weeks ill with fever, and complained for several months of an abdominal tumour. The uterus was explored, and found to be empty. When Mr. Sheild saw the patient she had a large circular orifice with sloughy margins in the situation of the umbilicus. Through this a black, pultaceous, offensive mass protruded. Chloroform was administered, and the protrusion was found to be the buttocks of a fœtus. The opening was enlarged and the fœtus extracted; the placenta was removed piecemeal.

The large number of "unpublished" cases in the instructive table occupying page 317 was obtained by a private circular in 1895.

CHAPTER XLII.

TUBAL GESTATION IN THE LOWER MAMMALS.

The subject of tubal gestation in the lower mammals is somewhat outside the province of this work; it will therefore be very briefly considered. It is, however, important to mention it, because a few of the specimens to be described are useful in throwing light upon some conditions met with in tubal fœtuses in the human subject, and also because it serves to reflect some of the confusion prevailing on the subject of tubal pregnancy generally up to the last ten years.

A prolonged and wide search through veterinary literature, and an examination of a few museum specimens supposed to illustrate tubal gestation, have convinced me that *there is no specimen or description of a case of tubal pregnancy in a mammal other than the human female that will bear criticism*, with the single exception of an example reported by Waldeyer.* The patient in this instance was a baboon (*Cynocephalus hamadryas*), which died in the Zoological Gardens, Berlin; but even in this interesting case the description does not allow of an absolute interpretation.

It may be at once pointed out that the mistake is due to the circumstance—especially when the cases are recorded by medical practitioners—that the reporters invariably mistake the elongated uterine cornua for the Fallopian tubes. This is not surprising when we remember that in so many mammals the tubes are rarely thicker than ordinary whip-cord, and, in addition, are usually curled up and partially concealed in the walls of the ovarian sac. With a little care, however, and using the abdominal ostium of the tube as an indicator, no difficulty should be experienced. In the accompanying figure a sketch of the

* *Cent. f. Gyn.*, 1893. For an excellent *précis* of the case by Dr. Giles, *see* "Clinical Sketches," 1895, vol. i. p. 107.

uterus of a ewe with its cornua and tubes, shows the general relation of the parts when they are stretched out (Fig. 132).

The conditions usually reported as tubal gestation are due to two causes :—

(1) *Abnormal retention of the fœtus in the uterus.*

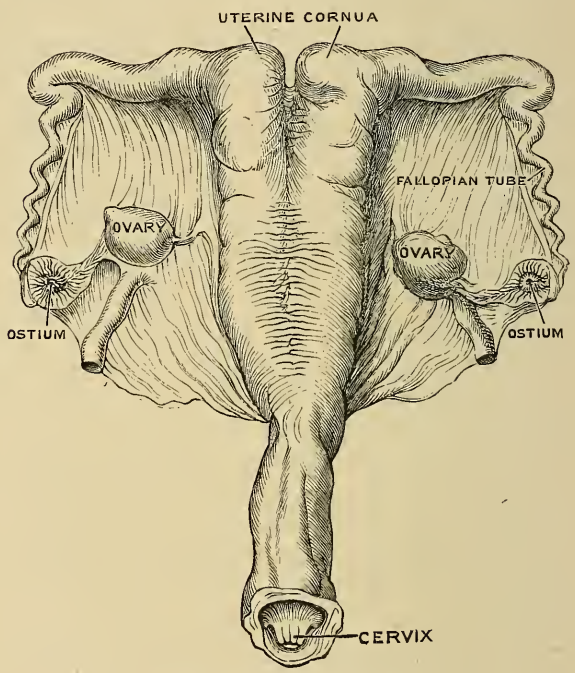

Fig. 132.—Uterus of a Ewe.

(2) *Rupture of a gravid uterus or one of its cornua, and retention of the embryo in the cœlom or sub-peritoneal tissue.*

In domesticated mammals the gestation period for a given species varies within certain limits. Hence : eleven months for a mare, nine months for a cow, five months for ewes and goats, four months for sows, two months for the bitch and cat, are, like nine months for women, only average periods.

Pregnancy may in cows or mares over-run the average

by a few days, two weeks, a month, or even more, and a healthy fœtus be born. With such conditions we are not concerned.

(1) **Abnormal Retention of a Fœtus.**—This expression is applied to those cases in which an animal goes to full term, and then passes through an ineffectual labour; the pains cease,

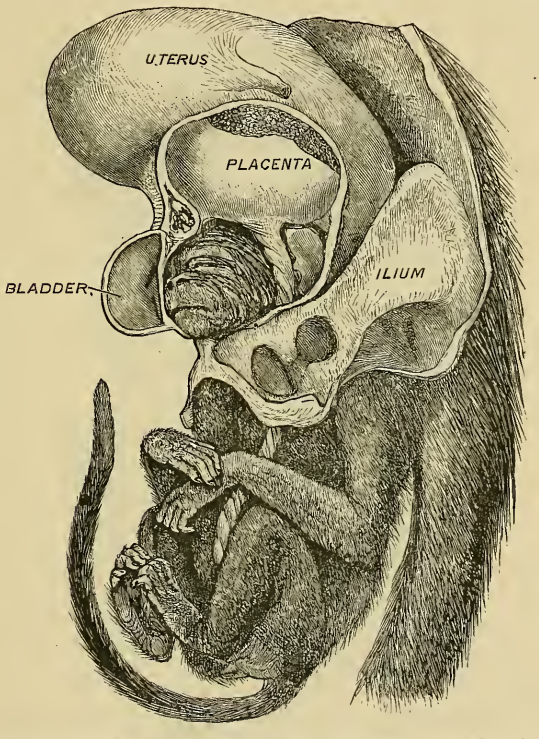

Fig. 133.—Incomplete Delivery in a Monkey, due to abnormal size of the Fœtus. (Museum, Royal College of Surgeons.)

the abdominal enlargement subsides, and, as a rule, the *rut* fails to appear, the animal remaining permanently sterile.

The Causes of Abnormal Retention are:—

(1) *Unusual size of the fœtus.*

(2) *Torsion of the uterus or one of the cornua.*

It is well known that when the male is large and out of proportion to the female, the fœtus may be too large to

pass through the pelvis. An example of this is sketched in Fig. 133. The drawing represents the pelvis and uterus of a Macaque monkey (*Macacus sinicus*) which died during delivery. When the keeper left the monkey-house in the evening he noticed the animal was restless. On his return next morning he found it dead, with the limbs and trunk

Fig. 134.—Mummified Calf retained in the Uterus eighteen months. (Museum of St. Bartholomew's Hospital.)

of a full-time fœtus protruding. The pelvis was far too small to allow the head to pass out. The specimen is in the museum of the Royal College of Surgeons.

The fœtus may be retained from unexplained causes. One of the most remarkable instances of this is the specimen presented to the museum of St. Bartholomew's Hospital by Dr. Matthews Duncan. The history of the case is briefly this:—

The Earl of Southesk's famous cow, *Esmeralda*, was

served July 7th, 1865. She had rinderpest in December of the same year, when probably the fœtus died, and the cow recovered. There were no signs of labour during the rinderpest or at the date when pregnancy should normally terminate. She was regarded as having become sterile, and was fattened for the butcher. In October, 1867, the almost forgotten pregnancy was brought to recollection by the discharge of a mummified calf without anything like the

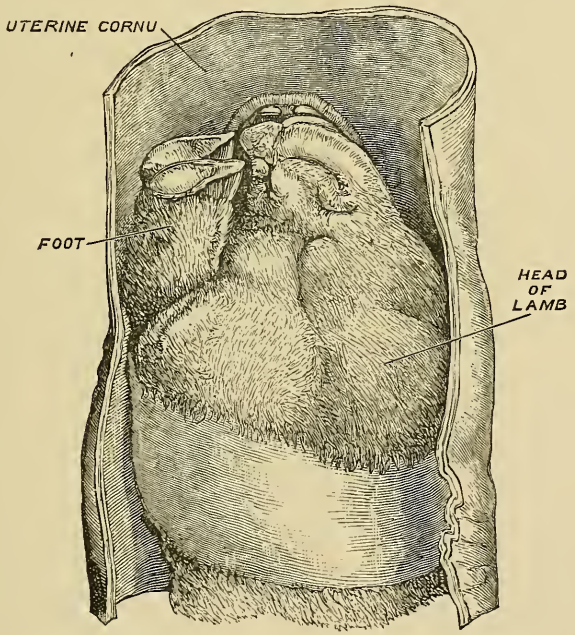

Fig. 135.—Head and one of the Feet of a Lamb retained in the Uterus. (Museum of the Royal College of Surgeons.)

usual manifestation of labour. It is, of course, possible that the death of the calf was the cause of its retention (Fig. 134).

This case presents an unusual feature, for the rule is that when a fœtus is retained in the uterus from causes other than torsion, it rapidly undergoes putrefaction. In some it becomes converted into adipocere.

The museum of the Royal College of Surgeons contains some specimens illustrating this condition, taken from cows and ewes. One of them is "a portion of the horn of the

uterus of a sheep, containing the head and one of the feet of a lamb, which remained in the uterus beyond the ordinary period of gestation, and became adherent to the surrounding uterine wall" (Fig. 135). Several of these specimens are *Hunterian*.

When a fœtus is retained and air gains access to it, or in consequence of adhesion to the bowels intestinal contents enter the gestation sac, decomposition rapidly ensues, and the soft parts speedily decay and make their escape, accompanied by putrid and highly offensive discharges, either through the vagina or rectum, or by fistulous tracts in the abdominal wall. Occasionally the bones will come away, but more frequently they are retained, and when the animal dies or is killed, the uterus is found filled with a more or less comparatively macerated skeleton.

Axial Rotation of the Gravid Uterus.—This curious accident has been most carefully studied in the cow. The whole uterus may rotate, the twists involving the vagina and cervix uteri. The rotation may vary from half a turn to three or more complete revolutions. The directions of the twist may be to the right or to the left.

Complete torsion offers an effectual barrier to delivery, unless help is afforded by art, and this is rarely of much service. The effect upon the cow is often to cause death by hæmorrhage, exhaustion, or rupture of the uterus. In rare cases the cow survives the accident, remains sterile, and the true nature of the case is revealed when the animal is handed over to the butcher. Under such conditions the fœtus is found either as a lithopædion or as a mummy.

When the torsion involves one cornu, it may be so complete as to actually lead to its detachment.

Mr. Hutchinson* reported a specimen of this which he met with in a hare. The abdomen contained a rounded tumour as large as a big orange. The tumour fell out when the belly was opened. On careful dissection, it was found to be a detached cornu of the uterus, containing two fœtal hares.

Detachment of a gravid uterine cornu secondary to axial

Trans. Path. Soc., vol. v. p. 352; 1854. *See also* Dohrn, Virchow's *Archiv*, xxi. p. 249, and Klebs, *ibid.*, xxxiii. p. 535.

rotation has been observed in the ewe, cow, guineapig, and cat, as well as the hare.*

(2) **Retained Fœtuses secondary to Rupture of the Uterus.**—The gravid uterus may be ruptured from traumatism; with this we are not concerned. A not infrequent cause is that the fœtus is too large to traverse the maternal passages, and the uterus, in its violent contractions to overcome the obstruction, ruptures, and the fœtus or fœtuses may be

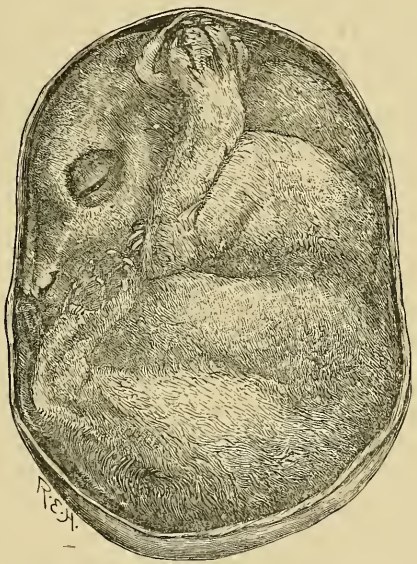

Fig. 136.—Pup in its Amnion which had been retained with two others in the Cœlom of a Retriever Bitch subsequent to Rupture of the Uterus.

discharged into the abdominal cavity. In such cases the fœtus may be found in the cœlom, whilst the placenta remains in the uterus; in others, the placenta, as well as the fœtus, will be extruded into the belly. After the fœtus escapes, the uterus rapidly contracts; hence a slit, which allows a full-sized fœtus to escape from the uterine cavity, rapidly becomes reduced to an opening of very small dimensions. It is unusual for a case of this sort to give rise to any difficulty in interpreting the course of events;

* Simmonds, *Veterinary Record*, vol. v. p. 492; Fleming, "Veterinary Obstetrics."

the majority of such accidents terminate fatally. In rare instances the mother survives, and the embryos are sometimes subsequently discovered adherent to omentum or bowel. This is a common accident in ewes and bitches. It is, however, necessary to point out that the cases reported in veterinary literature as examples of extra-uterine gestation are nearly all of this nature.*

The pup shown in Fig. 136 was removed from the cœlom (peritoneal cavity) of a retriever bitch with two others. The animal was known to be pregnant, but labour never occurred; but at the time the bitch should have been delivered she was very ill. Three months after this date she died. One pup was loose in the belly; the others were adherent to the omentum.

* Hamilton, *Journ. of Comp. Med. and Surgery*, April, 1891.

Part IV.

DISEASES OF THE PELVIC PERITONEUM.

CHAPTER XLIII.

THE PELVIC PERITONEUM.

For a correct appreciation during life of the morbid anatomy of the ovaries and Fallopian tubes it is necessary to study in some detail the relation of the peritoneum to the pelvic organs.

The pelvic peritoneum in women not only presents a more complex disposition than in men, but differs in the fact that the pelvic cavity communicates with the exterior by means of the genital tract.

The peritoneum as it descends from the posterior wall of the abdomen enters the cavity of the true pelvis, covers the anterior face of the sacrum and the first part of the rectum; it gradually leaves the sides of the second part of the rectum and, passing on the upper 2 cm. of the posterior wall of the vagina, is prolonged upwards on the posterior surface of the uterus. After covering the fundus, it descends on the anterior face of the body of the uterus and leaves it to cover the posterior surface of the bladder, and ascends on the posterior aspect of the anterior abdominal wall.

THE PERITONEAL FOLDS AND RECESSES.

The Mesometrium (broad ligament).—This important fold is formed by the peritoneum as it is reflected over the uterus and Fallopian tubes. Strictly, the mesometrium is a continuous fold of peritoneum, but for descriptive and clinical purposes it has been found convenient to regard it as consisting of a right and a left half. These folds are directly continuous laterally with the peritoneum lining the iliac

fossæ, and on the right side with the serous covering of the cæcum and its appendix.

The Recesses of the Pelvis.—There are normally two well-marked pouches or recesses formed by the peritoneum as it invests the pelvic viscera.

Of these the **recto-vaginal** (Douglas's) is situated between the rectum, the posterior surface of the uterus, and upper 2 cm. of the vagina, and the **utero-vesical** pouch, between the anterior surface of the body of the uterus and the bladder. Of the two pouches, the recto-vaginal is the deeper, and extends lower on the left than on the right side.

Champneys* has described a case in which he found a diverticulum large enough to receive and conceal the first joint of the middle finger, at the bottom of the recto-vaginal pouch, its lowest point being 4 cm. below the level of the neck of the uterus.

Matthews Duncan reported a similar case. (*See* page 135.)

In cases of bicorned uteri in the human female of the variety *uterus bicornis unicollis*, a median vertical fold of peritoneum divides the recto-vaginal pouch, and, continuing forward between the uterine cornua on to the posterior aspect of the bladder, also divides the utero-vesical pouch into two lateral shallow depressions. (*See* Fig. 129.)

Relation of Peritoneum to the Pelvic Organs.—The degree to which the pelvic organs are invested by the peritoneum varies much, and has very important relations in determining the course of fluid, such as pus and blood. It has already been mentioned that the first part of the rectum is almost completely invested, whilst the second part is only covered on its anterior surface. It clothes the uterus behind and in front, whilst its sides are in relation with the narrow connective-tissue tract of the mesometrium. The vagina is only immediately in relation with the peritoneum by the upper 2 cm. of its posterior cul-de-sac. The bladder is covered on that portion of its posterior surface situated above a line drawn across the entrance of the ureters.

The subserous tissue varies in quantity in different situations. Over the sacrum it is very loose (occasionally one of the kidneys is situated in the hollow of this bone), and the

* Trans. Obstet. Soc. London, vol. xx. p. 124.

laxity of the tissue will allow of its free movement up and down or from side to side. In front of the bladder the tissue is very loose and capable of division into two layers; the potential space between them is sometimes called the **cave of Retzius**. In the adult a large plexus of veins lies in the vesical wall of this imaginary cave.

The Structures lying in the Folds of the Mesometrium.—In addition to connective tissue and plain muscle fibre, each mesometrium contains the Fallopian tube, the ovary, parovarium with Gartner's duct, the ligament of the ovary, the ureter, numerous blood-vessels, lymphatics and nerves. In order to appreciate the pathological relations of the mesometrium it is necessary to indicate the position of the various organs contained between its layers. When the parts are stretched out the Fallopian tube will be found to occupy the free border and to be attached by the tubo-ovarian ligament to one extremity of the ovary. The opposite pole of the ovary is connected by the ligament of the ovary to the side of the uterus. The upper part of the mesometrium is called the **mesosalpinx**, and is included between the Fallopian tube, the tubo-ovarian ligament and the ovary with its proper ligament. It contains between its layers the parovarium and the associated portion of Gartner's duct, the ovarian artery, a plexus of veins, and, passing from its anterior and inner part close to the uterine end of the Fallopian tube, the round ligament of the uterus.

The round ligaments arise from the upper angles of the uterus anterior to the Fallopian tubes; each passes obliquely forward to gain the internal abdominal ring, in order to traverse the inguinal canal. A fold of peritoneum, directly continuous with the anterior layer of the mesometrium, partially invests these muscular cords, and forms a narrow pouch in the inguinal canal, known as the **canal of Nuck**, generally obliterated in the adult. It corresponds in situation and mode of formation with the funicular pouch of peritoneum in the male. These peritoneal pouches are formed about the period at which the ovaries descend from their lumbar position, near the kidneys, to their acquired situation in the pelvis.

Two strands of tissue, the **utero-sacral ligaments**, pass

from the sides of the sacrum, as high as the body of the second sacral vertebra, to the lateral aspect of the supra-vaginal portion of the neck of the uterus.* They give rise to the peritoneal folds on each side of the pelvis, which form the lateral limits of the recto-vaginal pouch.

The portion of the mesometrium below the mesosalpinx contains the ureter, some large veins, the uterine artery as it passes from the iliac trunk to gain the uterus, and the fibrous cord representing the obliterated hypogastric artery. The lower part of the mesometrium differs from the meso-salpinx in that the two layers are more separated from each other, the connective tissue is of looser texture and allows fluid accumulations on one side to pass around the uterus; an abundant hæmorrhage, or a fluid effusion into the left mesometrium, will make its way round, and sometimes constrict, the second part of the rectum. When extensive, such effusions will raise up the anterior layer of the meso-metrium and present at the level of Poupart's ligament, especially in the neighbourhood of the inguinal canal; occasionally the fluid will pass round the bladder and invade the connective tissue in the cave of Retzius. The laxity of the subserous tissue near the pelvic brim will allow pus collected around a suppurating or sloughing vermiform appendix occasionally to make its way between the layers of the mesometrium; this, however, can only happen when the pus finds its way between the layers of the meso-cæcum.

The facility with which the anterior layer of the mesometrium can be stripped up, except when firmly fixed by old inflammatory adhesions, explains the frequency with which pelvic abscess points in the neighbourhood of Poupart's ligament. Large tumours growing from the side of the uterus, or from the connective tissue of the mesometrium, or a fœtus developing between its layers, will in some instances raise up the anterior layer and insinuate themselves between the peritoneum and the front wall of the abdomen. The fact that the tissue in the mesometrium contains unstriped muscle fibre is of some importance, as it plays a part in

* For a detailed and historical account of the utero-sacral ligaments and the cave of Retzius, consult Delbet, "Des Suppurations Pelviennes chez la Femme;" Paris, 1891.

several morbid conditions. It is important to remember that whereas fat is present and usually abundant in the subserous tissue, it is, as a rule, wanting in the mesometrium. Occasionally, however, fat is found in this situation, and has been known to be so abundant as to form a fatty tumour.

The Mesosalpinx and its Contents.—The peculiarity of cysts and tumours in their behaviour to the mesometrium will be more fully discussed afterwards. We must, however, devote here some space to the consideration of the anatomy of the mesosalpinx and its contents.

The Fallopian Tube.—It has already been mentioned that each tube lies in the free border of the mesosalpinx, and is invested on two-thirds of its circumference by peritoneum. The muscle tissue of the mesometrium is directly, though loosely, continuous with the muscle tissue of the wall of the tube. That the tube is loosely connected to its peritoneal coat is shown by the fact that it moves to a certain extent independently of its serous investment. For instance, in the fœtus, near the time of birth, and for a year or two afterwards, the Fallopian tubes are very tortuous. This tortuosity, or angulation as it is sometimes called, is due to the tube increasing in length at a greater rate than the mesometrium. When the uterus rises out of the pelvis during pregnancy the tubes are elongated and hypertrophied; when involution follows delivery at term, and the parts sink to their usual position, the tubes remain for a time tortuous. Again, when the tubes inflame, they lengthen, and the increase in length manifests itself in angulation.

The Ovary.—The relation of this gland to the mesometrium is very different to that of the Fallopian tube. When the parts are examined from the front aspect the ovary is not seen, whereas on the posterior aspect it is a conspicuous object. This is due to the fact that, whereas the tube is invested by both layers of the mesometrium, the ovary is suspended by the posterior layer.

Arteries.—The most important are the uterine and the ovarian. The *uterine artery* is given off by the anterior division of the internal iliac; it runs under the peritoneum towards the cervix of the uterus, and then turns upwards as soon as it gets between the folds of the mesometrium, and

runs for a space by the side of the uterus, nearer the posterior than the anterior surface, and as it approaches the fundus inosculates with the ovarian artery. As the artery ascends it gives off branches to the anterior and posterior surface of the uterus, which anastomose with similar branches from the uterine artery of the opposite side.

The *ovarian*, like the spermatic artery in the male, arises from the abdominal aorta below the renal vessels, and runs downwards to pass between the layers of the mesometrium at the brim of the pelvis, then makes its way to the side of the uterus near the fundus, to inosculate with the uterine artery. In its course it distributes numerous branches to the ovary, Fallopian tube, fundus of the uterus, and the mesometric connective tissue; it also gives a branch to anastomose with a small vessel derived from the deep epigastric artery which is conducted along the round ligament.

Veins.—These follow much the same course as the arteries to which they belong, but the various branches of the ovarian vein are very large, and when the ovary forms a large cyst, or the uterus is occupied by a myoma, or is gravid, these veins become greatly dilated. The *ovarian veins* are situated mainly in the mesosalpinx, where they give rise to the **pampiniform plexus,** which is homologous with the plexus of the same name in the male, and, like it, represents the persistent veins of the mesonephros (Wolffian body).* Near the outer end of the mesometrium the veins coalesce, and a single trunk finally issues, to terminate on the right side in the inferior vena cava, and on the left side in the renal vein.

The long course which the ovarian arteries and veins pursue is explained by the fact that in the early embryo the genital glands in each sex lie in the loin, in relation with the kidneys, and receive their blood supply from the immediately adjacent aorta; as the glands—testes or ovaries—descended into the scrotum, or pelvis, the arteries and veins became elongated.

THE BLADDER AND URETERS IN THE FEMALE.

The Bladder.—This viscus is so directly concerned in the differential diagnosis of abdominal tumours and in operative

* Author: Trans. Path. Soc., vol. xxxvi. p. 525.

procedures in the pelvis, and is, with the ureters, so often in danger of injury, and not infrequently these structures are actually seriously damaged, that it is necessary briefly to summarise their chief relations. This is not difficult, as the anatomy of the bladder and ureters in its surgical bearings has been very carefully investigated. Except when considerably distended, the bladder lies behind the pubes and does not rise so rapidly out of the pelvis as in the male. When over-distended it forms an oval cyst situated exactly behind the middle line of the anterior abdominal wall. Sometimes it is drawn upwards and spread out laterally over the anterior surface of a uterine tumour. As the bladder distends with urine and extends upwards into the abdomen it displaces the peritoneum and, in some cases in which the bladder is permanently drawn upwards by a tumour, it will lie in front of the peritoneum even when empty, and has, under such conditions, been opened by the knife of an incautious surgeon, unaware of the possibility of this alteration in its position. The eye of the experienced surgeon usually prevents this accident, for the muscular coat of the bladder, when deprived of its serous coat, has a very characteristic appearance.

The Ureters.—These ducts enter the pelvis near the point of division of the common iliac arteries—sometimes slightly above, sometimes a little below the point of bifurcation. The ureters dip down the posterior wall to near the ischial spines; from this point, still descending, they pass forward and inward, lying in the connective tissue at the base of the mesometrium, and pass within 1 cm. of the neck of the uterus; descending along the side and upper part of the vagina, they turn to the middle line and enter the posterior wall of the bladder. Whilst the ureters are passing from the posterior wall of the pelvis, to gain the side of the neck of the uterus, they are crossed by the uterine arteries. In the operation of ovariotomy a ureter may be damaged when the cyst is fixed by firm adhesions near the brim of the pelvis.

CHAPTER XLIV.

DISEASES OF THE PELVIC PERITONEUM.

In the preceding chapter it was pointed out that the peritoneum in the pelvis is not only much more complexly arranged and invests more organs in the female than in the male, but differs from it in the important fact of having a mucous canal (the Fallopian tube) in direct communication with it.

The frequency of peritonitis in women is out of all proportion to its occurrences in men, and the excessive liability of women to peritoneal infections is almost entirely due to the curious relationship of the pelvic portion of the cœlom to the Fallopian tubes.

The diseases of the pelvic peritoneum are of very great importance; they will be considered under the following headings:—

(1) Septic Infection.
(2) Epithelial Infection.
(3) Hydroperitoneum.

(1) **Septic Infection.**—In dealing with salpingitis it was pointed out that septic affections of the uterus, whether arising primarily in the cavity of that organ or extending to it from the vagina, are very liable to implicate the Fallopian tubes. In a fair proportion of cases the inflammatory process extends beyond the tube and directly infects the pelvic peritoneum.

When the septic matter which thus escapes into the cœlom is very virulent, grave disturbances are set up and death may ensue in a few days.

On one occasion I removed from a woman, aged forty-three, a large sloughing myoma which had been extruded from the uterus into the vagina. The uterine and tubal mucous membrane were gangrenous. The myoma was removed by means of an ecraseur, and the uterine cavity freely irrigated with sublimate solution (1 in 2,000); for a few days after the

operation the patient promised to do well; there was no pain or tenderness; the temperature rose to 101° in the evening, but in the morning fell to 99°. This rise was due to the condition of the uterus. On the evening of the third day after the operation the patient complained of sudden acute abdominal pain followed by symptoms of shock, and she seemed about to die; the temperature fell from 101° to 97° Fahr. In twelve hours the collapse passed off, severe peritonitis followed, and the patient died two days later. At the *post-mortem* examination septic fluid and sloughs of the tubal mucous membrane were found projecting from the unclosed ostia of the tubes (Fig. 137).

It was mentioned in chapter xxiv. that in a large number of cases salpingitis is a result of septic endometritis following on abortion or delivery at term; it is important also to appreciate the fact that when pelvic peritonitis occurs as a sequel to labour it is in very many cases called "puerperal fever" or "puerperal peritonitis." As a matter of fact, observations are by no means wanting to demonstrate that in many cases thus classed, the disaster (inducing in very many cases death of the patient) was due to actual conveyance of septic matter from the uterine cavity into the recto-vaginal pouch.

In women suffering from gonorrhœa and septic vaginal discharges the uterine mucous membrane becomes infected, and in many cases the infection extends to the tubes. In the majority of instances the abdominal ostium of the tubes becomes occluded, and the leakage of pus into the recto-vaginal fossa is prevented. This does not always happen, and cases have been observed in which at the time the leakage has occurred the symptoms have been so severe as to cause surgeons to open the abdomen. In such circumstances the pus has been seen leaking from the tubal ostium. Such a case came under my own observation in a young prostitute.

When the infecting material is of a mild type the effects are modified: local peritonitis leads to adhesion of the viscera, occlusion of the tubal ostia, and sterility.

There is a somewhat unusual variety of pelvic peritonitis secondary to salpingitis to which Sir J. Williams* has given the name of *serous perimetritis*. The essential features of the

* Trans. Obstet. Soc., vol. xxvii. p. 169.

condition consist in a collection of inflammatory exudation in the recto-vaginal fossa which floats up the adjacent intestines and omentum, which become matted together, and to the uterus, so as to form a sort of spurious roof to the pelvis.

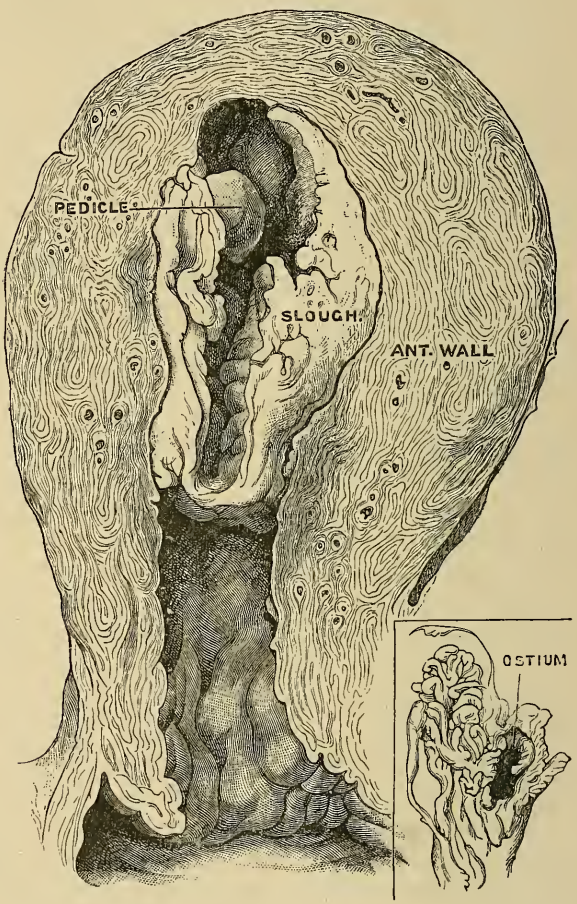

Fig. 137.—Section of a Uterus from which a Gangrenous Myoma had been removed. The mucous membrane had become gangrenous, and infective material had leaked into the cœlom through the unclosed ostium.

Under these conditions the fluid collected in the pelvis very closely simulates a cyst.

When inflammatory exudation collects in the utero-vesical pouch and becomes, as it were, encysted by the

intestines, the condition is sometimes called "anterior serous perimetritis." The physical signs of such a collection of fluid have so deceived some surgeons as to lead them into the belief that they had to deal with an ovarian tumour.

The liability of tubal disease to infect the peritoneum is illustrated in tubercular salpingitis. (*See* page 209.)

In addition to infection of the pelvic peritoneum in the acute stage of salpingitis supervening on labour or abortion, there is a further grave source of danger which is very apt to be overlooked—namely, the great liability of a distended pus-containing tube to burst during labour. Under such conditions the real source of trouble is rarely suspected, and the severe pelvic and constitutional disturbance which follows is ascribed to "puerperal peritonitis."

Delbet* mentions that Siredey, in a thesis published in Paris, 1860, states that in twenty-nine autopsies made upon women who had died from puerperal affections he found in twenty-two the tubes dilated, full of pus, and the ovaries purulent.

In Great Britain very little attention has been devoted to this subject. The most significant observation on this matter is that made by Chapman Grigg,† to the effect that in five patients who died at Queen Charlotte's Lying-in Hospital with symptoms of *puerperal fever*, out of a total of 548 deliveries, extending over a period of nine months, four were due to antecedent disease of the ovaries or tubes. The conditions found in each case *post mortem* were :—

(1) Multilocular cyst of right ovary, containing pus.
(2) Abscess of left ovary and pyosalpinx.
(3) Ovarian cyst (ruptured) and old pelvic cellulitis.
(4) Chronic inflammation of the mesometrium and Fallopian tubes, causing pressure on the ureters (eclampsia).

In the four cases the patients were young women, their ages being twenty-one, twenty-two, twenty-three, and nineteen years respectively. Such a record is very significant, and needs no comment.

* "Des Suppurations Pelviennes chez la Femme," Paris, 1891.

† *Journal of the British Gynæcological Society*, vol. ii. p. 264.

Fortunately midwifery practitioners are growing alive to these things and seek timely surgical aid. To the description of ruptured and suppurating ovarian cyst during the *puerperium* a brilliant series of successful cases is appended (page 191), and may be reperused in relation with the subject-matter of this chapter.

(2) **Epithelial Infection.**—In this book mention has been made of epithelial infection of the peritoneum, and it will be useful briefly to summarise our knowledge of this condition. It occurs in connection with the following affections :—

(*a*) Papillomatous cysts.
(*b*) Ovarian dermoids.
(*c*) Cancer of uterus, gall-bladder, rectum, and sigmoid flexure.

It has already been stated that when papillomatous cysts rupture into the cœlom the fluid contents of the cysts, often heavily charged with cells, are scattered over the peritoneum ; it naturally follows that the recto-vaginal and utero-vesical fossæ become inundated with fluid and the cells naturally sink to the lowest part of these recesses. In many cases the cells become engrafted on the peritoneum and grow into warts. This accounts, in cases of infection of this kind, for the abundance of warts on the pelvic peritoneum in comparison with other parts.

Similar changes are sometimes associated with the rupture of ovarian dermoids, and one case has been reported in which the peritoneum was beset with small tufts of hair secondary to an ovarian dermoid. Several cases have been carefully observed and reported in which the peritoneum has been dotted with minute dermoids secondary to the rupture of primary ovarian dermoids.

In chapter xlvii. it will be shown that echinococcus colonies sometimes infect the peritoneum in a similar manner.

The condition is more strongly exemplified when the peritoneum is infected with cancer. Anyone who has had merely a moderate experience in the deadhouse must have noticed in individuals dying from cancer of the uterus, colon, or gall-bladder that in the majority of instances the peritoneum is free from deposits. Yet occasionally a case comes

under observation in which the peritoneum is crowded with hundreds of minute nodules.

In such cases a careful examination of the tumour will reveal the existence of a small process of the cancer which has perforated its serous covering. This process may be no larger than a split pea, yet it is sufficient to produce hundreds of secondary nodules on the peritoneum. When the cancer involves the peritoneum, fluid is sure to be exuded (hydroperitoneum), and the movement of this fluid serves as an excellent means of disseminating the epithelium over the belly.

In one very striking case which came under my notice the mode in which the fluid serves to spread the cells was well illustrated; the patient had a hernial sac, and its walls were thickened and rigid from secondary nodules, and its cavity was filled with cell-laden fluid.

(3) **Hydroperitoneum.**—Free fluid in the belly arises from a variety of causes, but these form two groups. When the accumulation is secondary to renal or cardiac disease or portal obstruction it should be termed *ascites.* When fluid collects in the belly as a consequence of cancer, sarcoma, or tubercle, and as a complication of *epithelial infection*, it should be termed *hydroperitoneum.* It is also important to bear in mind that hydroperitoneum may be associated with hydrothorax.

Hydroperitoneum is sometimes associated with uterine myomata and occasionally with ovarian cysts and dermoids, but in these cases care must be exercised to avoid confounding a collection of fluid due to rupture of a cyst or leakage from a loculus of a polycystic tumour, with a hydroperitoneum.

A very interesting cause of hydroperitoneum, and one very liable to be overlooked, is due to tubal disease, especially salpingitis of a mild type which does not lead to occlusion of the ostium. Matthews Duncan pointed out that it may follow abortion, but the most instructive cases are those associated with adenoma of the Fallopian tube. In this disease the ostium remains widely open and the secretion from the tumour finds its way into the recto-vaginal fossa and irritates the peritoneum, producing hydroperitoneum (chapter xxvii.).

That the accumulation of fluid in these cases depends on tubal disease is made clear by the fact that when the tubes are

removed the fluid ceases to collect not only in the abdominal but also in the thoracic cavities, if the case be complicated with hydrothorax.

When hydroperitoneum depends on epithelial infection secondary to papillomatous cyst of the ovary, removal of the tumour permanently arrests the exudation.

Serous perimetritis is hydroperitoneum localised to the pelvis.

I have had cases in which fluid at first localised to the pelvis has gradually increased and floated up the intestines; these became matted and conglomerated so as to form a rounded resonant mass simulating a cyst distended with intestinal gases. *Serous perimetritis is occasionally the forerunner of suppurative peritonitis.*

Microscopical examination of fluids from the abdominal cavity affords no real help in diagnosis. Hydroperitoneum may be distinguished from ascites when the accumulation is accompanied by evidence of renal, cardiac, or hepatic diseases.

CHAPTER XLV.

PELVIC CELLULITIS.

Ten years ago it was customary to apply the term "pelvic cellulitis" to any hard irregular mass which could be detected on one or both sides of the uterus. With our present knowledge it is clear that many conditions were formerly erroneously included under this term, and the attempt to divide pelvic cellulitis into two varieties—such as *parametritis* when the inflammation is confined to the connective tissue, and *perimetritis* when it affects the pelvic peritoneum —was a sound step in the direction of discriminating between the various kinds of pelvic inflammation.

The greater accuracy in our knowledge of pelvic diseases which has followed the invasion of surgery into this region of the body has tended to deprive the terms parametritis and perimetritis of much of their former importance; there is no doubt that a very large proportion of pelvic swellings previously classed under one or other of these names were really inflammatory troubles of the Fallopian tubes and ovaries.

Pelvic cellulitis signifies inflammation of the connective tissue of the mesometrium; pathologically it does not differ from septic inflammation of cellular tissue in more superficial regions of the body. It is usually associated with septic changes originating in the cervix and body of the uterus, following abortion, delivery at term—especially instrumental delivery—and operations upon the uterus.

The changes consist in the infiltration of the connective tissue of the mesometrium with inflammatory products, which, like such products in general, either undergo resolution, or suppurate and give rise to a pelvic abscess.

Symptoms.—It is very important to remember that pelvic cellulitis occurs most frequently as a complication of delivery

or abortion. The trouble usually declares itself by high temperature, headache, sometimes rigors and pelvic pain.

On physical examination in the early stages the infiltration will be found to surround the neck of the uterus like a ring, and then extend indefinitely into each mesometrium. The mobility of the uterus is impaired, and it seems as if this organ were embedded in some firm material. Should the inflammation continue, the infiltration will extend backwards and surround the rectum; anteriorly it will pass forwards under the peritoneum and creep up the anterior abdominal wall, even as high as the umbilicus.

Occasionally it infiltrates the connective tissue in the cave of Retzius and forms sometimes a rounded swelling immediately above the pubes; in a small proportion of cases the exudation extends into the tissue between the cervix uteri and bladder, raises up the peritoneum and obliterates the utero-vesical pouch. Such exudations sometimes give rise to considerable hypogastric swellings and cause extreme irritability of the bladder.

In a very large proportion of cases the exudation subsides in the course of a few weeks and the patient recovers; in some it slowly extends into the subserous tissue and converts the belly wall into a firm resisting mass. In such cases the illness may be prolonged for many weeks and even months.

In a certain proportion of cases suppuration occurs and a pelvic abscess is the result.

The common forms of pelvic cellulitis are rarely mistaken for other conditions, and should there be any doubt a little patience will, in most cases, enable a correct diagnosis to be made, for rest promotes absorption of the exudation.

Anterior Parametritis.—This unusual variety affects mainly the connective tissue between the bladder and uterus. In the specimen represented in Fig. 138, a large cavity filled with pus is situated between the uterus and bladder. The obliterated hypogastric artery and the urachus traverse the space.

The chief physical signs of this variety of pelvic cellulitis are hypogastric tumour, which is easily enough felt through the anterior vaginal wall, and vesical irritability.

It is important to remember that vesical irritability, by

no means uncommon in pelvic cellulitis, is due to other causes than the implication of the peri-vesical cellular tissue.

In some cases which have come under my notice where pelvic cellulitis has followed the removal of inflamed and adherent tubes, the exudation has surrounded and entangled

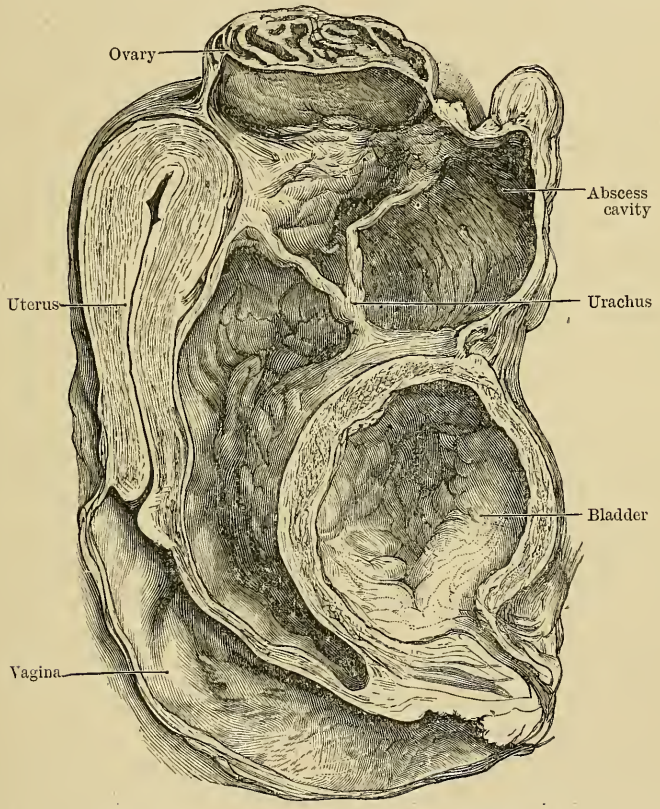

Fig. 138.—Sagittal Section of the Parts involved in Pelvic Cellulitis (anterior Parametritis) implicating the Cave of Retzius. (Museum of the Royal College of Surgeons.) *

the vesical end of a ureter and has produced such irritation that the patient's life has been placed in danger from the exhaustion induced by frequent micturition.

When the vesical end of a ureter is greatly dilated, it will form a distinct swelling which can be felt on vaginal examina-

* *See* Griffith: Trans. Obstet. Soc., vol. xxix. p. 149.

tion bulging like the "pointing" of an abscess in the fornix of the vagina. In a patient under my care on whom I had performed oöphorectomy nine months previously, a localised swelling of this sort so simulated a pelvic abscess that I opened it through the vagina, but no pus escaped; twenty-four hours later it was clear that urine was escaping through the vagina. A subsequent investigation of the parts demonstrated the existence of a ureteral fistula. It closed spontaneously in sixteen days. Later it became necessary to perform nephrectomy; the operation was successful, and the vesical irritation rapidly subsided.

Pelvic Abscess.—The term pelvic abscess is now exclusively reserved for collections of pus arising in connection with the mesometrium. In the majority of cases it is one of the results of pelvic cellulitis; less frequently it is due to suppuration in connection with mesometric pregnancy, and still rarer with echinococcus cysts (hydatids) beneath the pelvic peritoneum.

The signs of pelvic abscess are those manifested by pus collections in other parts of the body, namely, high temperatures, rapid pulse, rigors, etc., with local swelling, tenderness, pain, and sometimes reddening of the skin.

When left to pursue its own course a pelvic abscess may point and burst in a variety of positions. Thus it may open into the rectum, bladder, or vagina; these are the common routes of escape. Not infrequently the abscess points in the neighbourhood of Poupart's ligament, being conducted to the region of the inguinal canal by the round ligament of the uterus. Exceptionally the pus burrows under the fascia lata and escapes through the saphena opening or the obturator foramen and points in the front or the inner side of the thigh; pus from the pelvis has been evacuated as low as the popliteal space. In some instances the abscess extends into the abdominal wall, and travelling along the obliterated hypogastric arteries, or the urachus, points in the vicinity of the navel. In some cases the pus may escape through the sciatic foramen and burrow into the buttock; occasionally it makes its way from the pelvis into the iliac fossa and extends behind the peritoneum as high as the kidney, thus simulating a peri-renal abscess. When pus from the pelvis

invades the right iliac fossa it comes into relation with the cæcum and simulates abscess connected with a diseased vermiform appendix. It should be borne in mind that a peri-cæcal abscess will sometimes burrow between the layers of the mesometrium and simulate pelvic abscess.

The pus furnished by a pelvic abscess is often intensely fœtid; this is mainly due to contamination from the bowel. In the course of the formation of the abscess the peritoneum is stripped from the wall of the rectum, and its tissues becoming softened allow of the passage of intestinal contents, loaded with pathogenic micro-organisms, into the exudation, and putrefaction is established.

Treatment.—In the acute stages of pelvic cellulitis the patient is confined to bed and the bowels are kept regular by means of saline purgatives; and warm vaginal douches should be frequently administered by a careful nurse. When there is much abdominal pain, warm fomentations to the hypogastrium give great relief.

When suppuration occurs, and the pus can be localised, an incision should be made into it and the abscess drained. It is preferable to evacuate a pelvic abscess through the belly-wall rather than by an incision in the vagina. Should the abscess burst into the vagina, the aperture of communication is apt to close, and defective drainage leads to re-accumulation of pus; in these circumstances it is advisable to dilate the opening to ensure drainage. When the abscess is due to suppuration of a gestation sac, the sinus should be enlarged, and all fragments of bone and other fœtal tissues removed.

As in all cases of prolonged suppuration, the patient's strength must be supported by nutritious and easily digestible food; quinine and iron preparations are useful; and health should finally be restored by change of air.

CHAPTER XLVI.

TUMOURS OF THE MESOMETRIUM (BROAD LIGAMENT).

In addition to tumours of the ovary, parovarium and Gartner's duct, it is important to remember that tumours arise in connection with the round ligament of the uterus and the ovarian ligament as well as from the proper tissues of the mesometrium.

It is very important to discuss these tumours, because they so closely imitate in their physical signs ovarian tumours; in some the simulation is so complete that accurate diagnosis from physical signs is impossible.

It will be convenient to discuss them in the following order:—

(1) Lipomata.
(2) Myomata.
(3) Sarcomata.
(4) Echinococcus Cysts (Hydatids).

(1) **Lipomata.**—Under normal conditions fat may sometimes be found in small quantity in the deeper parts of the mesometrium and near the brim of the pelvis, but it is rarely met with in the mesosalpinx. On a few occasions I have found a small pad of fat in the neighbourhood of the parovarium, and in each case the uterus was occupied by myomata.

In cases where the ovaries are occupied by dermoids, the mesosalpinx and adjacent portions of the mesometrium have been found infiltrated with fine granular fat.*

It is very rare to find lipomata in the mesometrium; Parono† has described and figured such a specimen; the tumour, which was the size of a pear, occupied the mesosalpinx.

The largest and most important specimen of this kind was

* Doran: Trans. Path. Soc., vol. xli. p. 202. And Author: Trans. Obstet. Soc., vol. xxxiv. p. 7.

† *Ann. di Obstet.*, Milan, 1892, No. 2, p. 103 and pl. 1.

described by Treves.* The tumour weighed nearly 5 kilogrammes, and extended into the belly as high as the navel. The position, mode of growth, and physical signs of this tumour, caused it to be diagnosed as an ovarian tumour. The woman was thirty-two years of age. The lipoma was encapsuled; the operation, though not free from difficulty, was followed by good results.

(2) **Myomata.**—Unstriped muscle tissue, apart from the uterus and Fallopian tubes, exists in three situations between the layers of the mesometrium:—(*a*) In the round ligament of the uterus; (*b*) in the ovarian ligament; (*c*) in the connective-tissue between its folds.

In each of these structures myomata occasionally arise.

(*a*) **Myomata of the Round Ligament.**—Tumours of this structure may spring from the portion of the round ligament lying in relation with the inguinal canal, or that situated between the lamellæ of the mesometrium. Many instances have been described in connection with the inguinal segment under the name of desmoid tumours of the round ligament. Many of them were collected by Sänger.†

The specimen which formed the basis of his paper occurred in a woman twenty-two years of age. She had had three children. The tumour had been noticed many years. It began as a swelling the size of a dove's egg in the right inguinal canal. When she came under observation the tumour was of large size, occupying the right side of the pelvis, and extending upwards towards the umbilicus. It was removed, but the patient died twenty-four hours after the operation.

In rapidly-growing specimens the microscopical characters are usually described as fibro-myo-sarcomata. Slowly-growing tumours are usually firm in texture and are called fibro-myomata (or desmoid tumours). Sir Spencer Wells‡ reported two examples which he removed from women aged forty and fifty years respectively. One was the size and shape of a cocoanut, and the other was as large as an orange. In each case the tumour occupied the inguinal canal, and was removed without difficulty.

* Trans. Clin. Soc., vol. xxvi. p. 101.

† *Arch. für Gyn.*, Bd. xxi. p. 279.

‡ Trans. Path. Soc., vol. xvii. p. 188.

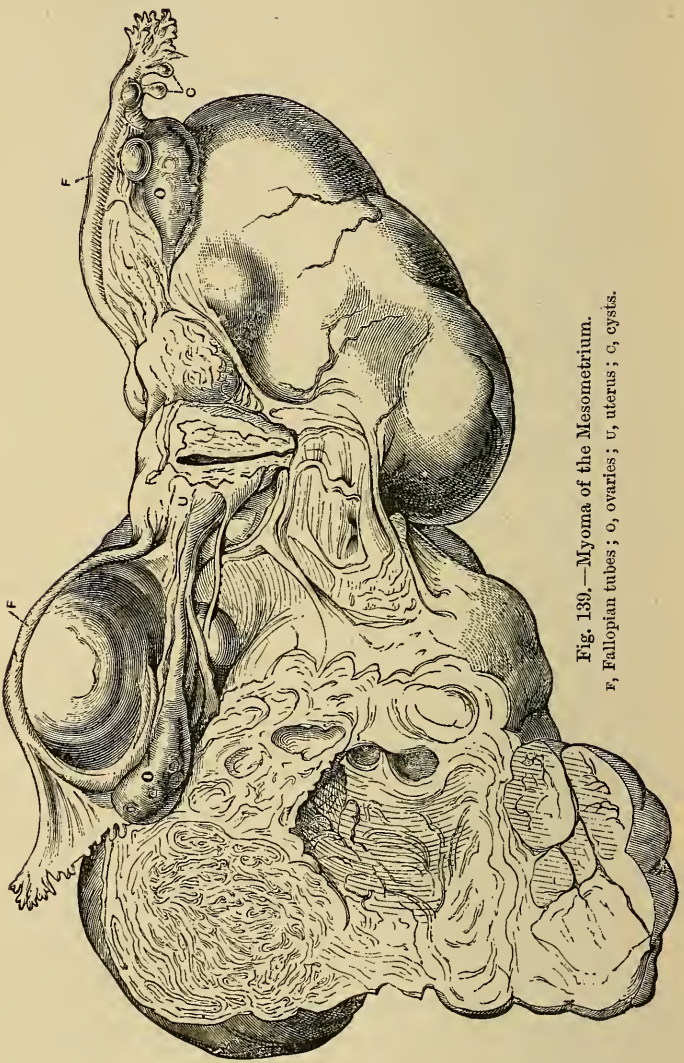

Fig. 139.—Myoma of the Mesometrium.
F, Fallopian tubes; O, ovaries; U, uterus; C, cysts.

"Histologically, the growth in each case was simply an excess of the fibrous tissue of the round ligament of the uterus."

Myomata of the pelvic segment of this ligament, judging from the few reported cases, are rare.

Matthews Duncan* met with one equal in size and shape to a hen's egg. It lay quite free in front of the right mesometrium. The right round ligament could be traced to its surface, where it ended in a capsule. Its pedicle was small and thick, about 5 mm. broad. The structure of the tumour was that of a dense fibroid, with numerous cretaceous points near its centre, its fibrous capsule being continuous with the round ligament.

(*b*) **Myomata of the Ovarian Ligament.**—A myoma in this structure is so rare as almost to be regarded as a curiosity; the largest sample which has come under my notice was no bigger than a child's fist. It projected on the posterior aspect of the mesometrium and resembled an enlarged ovary.

(*c*) **Mesometric Myomata.**—The connective-tissue between the layers of the mesometrium contains a quantity of plain muscle fibre directly continuous with that underlying the peritoneal investment of the uterus. This muscle-tissue is occasionally the source of myomata.

In the early stages a mesometric myoma is of oval shape and encapsuled. In more than half the cases there is a tumour on each side. Such myomata rarely cause inconvenience until they attain the dimension of cocoanuts.

After reaching a certain size they are apt to grow with extraordinary rapidity, and in a few months may attain a weight of 10 kilogrammes or more. As these tumours rise out of the pelvis they carry the uterus and its appendages with them; and the relation of these structures to the tumour is represented in Fig. 139.

In some cases these tumours will raise the anterior layer of the mesometrium and extend upwards as high as the navel, and strip the peritoneum from the anterior abdominal wall. Such tumours have been reported to weigh 30 kilogrammes.

The rapidity and suddenness with which mesometric

* Trans. Obstet. Soc. Edin., vol. iv. p. 195.

myomata sometimes increase in size are, in some cases, at least, due to inflammatory changes secondary to septic infection. I have assured myself of this fact in one of my cases, and traced the infection to an adherent coil of intestine.

Coincident with the growth of the tumour the health of the patient suffers, and the pressure on the veins at the brim of the pelvis produces œdema of the lower limbs.

The structure of these tumours is interesting. They are encapsuled, and on section exhibit the greyish-white colour so characteristic of myomata. Large specimens are honeycombed with irregular cavities due to softening and mucoid degeneration of the tissues, and calcareous plates are often present. In very large, rapidly-growing specimens the cavities and the tissue immediately adjacent furnish a yellow, tenacious, highly albuminous fluid.

During life these tumours furnish a loud systolic hum to auscultation. This sign is due to the vessels in the capsule, for the tumour itself is as a rule poor in vessels.

Mesometric (broad ligament) myomata have not been observed before the thirty-fifth year. The tumours most likely to be confounded with them are myomata growing from the side of the uterus and pushing their way between the layers of the mesometrium. Mesometric myomata demand careful study; it is certain that many have been described as sarcomata of the pelvis.

Treatment.—Myomata of the mesometrium are very formidable tumours to deal with. The most satisfactory method of dealing with them is to perform abdominal section and enucleate them.

More than half the patients succumb if operative interference be delayed till the tumour rises above the pelvic brim.

(3) **Sarcomata.**—As the mesometrium contains a fair amount of loose connective-tissue, it naturally follows that sarcomata would be expected in this situation. Nevertheless they are very rare tumours. Care must be taken not to confound them with myomata of the mesometrium.

In a case under my own care the chief features were these:—The patient was fifty-six years of age; the tumour grew with great rapidity, and formed a mass which did not

furnish the physical signs characteristic of the common forms of pelvic tumour. An attempt was made to remove it, but its great vascularity and the intimate manner in which the structures occupying the mesometrium were involved in the mass, caused the operation to be abandoned.

Microscopically the tumour exhibited the structure of a rapidly-growing spindle-celled sarcoma.

CHAPTER XLVII.

ECHINOCOCCUS COLONIES AND CYSTS (HYDATIDS) OF THE PELVIS.

THE subserous connective-tissue of the belly is a very favourite situation for echinococcus cysts, especially where it contains fat. The pelvic peritoneum, where it is in relation with the uterus, and forms the mesometrium (broad ligament), is devoid of fat. Hence echinococcus cysts are not so common in these situations as in the meso-rectum or omentum.

In relation with the pelvis it will be necessary to consider echinococcus cysts of—

(*a*) The uterus.
(*b*) The mesometrium.
(*c*) The bony pelvis.
(*d*) The omentum.

Before discussing them it will be necessary to point out that the ovary is the only abdominal organ which is not liable to these cysts. This immunity may be attributed to the circumstance that the ovary has no subserous connective-tissue in which they can flourish. It is true that Neisser has, in his industrious and oft-quoted paper,* collected references to seven cases of hydatid cysts in the ovary; but a study of the original reports shows that there was little reason in most of the cases to class them as hydatids of the ovary. Indeed, in one case the tumour was an ordinary ovarian adenoma. An ovary may be implicated in an echinococcus cyst of the omentum, mesometrium, or ilium, as is demonstrated by a specimen in the museum of St. Bartholomew's Hospital. **At present a primary echinococcus cyst or colony of the ovary is unknown.**

(*a*) **The Uterus.**—Echinococcus cysts growing beneath the serous covering of the uterus are rare tumours, but some clear

* "Die Echinococcen Krankheit.," Berlin, 1877.

accounts are accessible. Dr. A. A. Altormyan,* of Aleppo, North Syria, observed the following case:—A married woman thirty-five years of age came under his care complaining of a tumour in the abdomen. On examination a rounded, freely movable tumour about the size of the head was found. It did not appear to be connected with the uterus, and was thought to be ovarian. Operation was advised. Four months later the patient returned. The tumour was now twice as large as at the first examination. It was painful, and fixed in a more central position. She now consented to its removal.

When the abdomen was opened the tumour was found fixed by a few easily separable adhesions. The trocar drew off some light straw-coloured fluid. The pedicle originated in the substance of the uterus. An elastic ligature was passed around it, and the stump treated by the extra-peritoneal method. The tumour had a thick capsule formed from the fundus of the uterus, just above the attachment of the left Fallopian tube. Within the uterine capsule was found a thick, laminated, homogeneous elastic membrane, displaying a highly peculiar tremulous motion. The cyst contained about a dozen vesicles and some granular particles. Hooklets and buds from the lining membrane were detected by the microscope. The woman made a good recovery.

Graham † states that he witnessed an operation by Martin in Berlin for the removal of two tumours attached to the surface of the uterus. They were freely movable, having each a long constricted pedicle. On lifting them out of the belly they burst in the operator's hands. They were echinococcus cysts the size of a fist. Before operation they were suspected to be subserous "fibroids."

The following is a very exceptional case‡:—A girl fourteen years of age died in the Melbourne Hospital under the care of Dr. Moloney. She had tuberculosis of the lungs and intestine. There were echinococcus cysts in the lungs and liver. Attached to the peritoneum covering the fundus of the uterus there was a cyst 11 cm. in diameter. It was adherent to, and

* *Lancet*, 1891, vol. i. p. 769.

† "Hydatid Disease," p. 137.

‡ *Australian Med. Journal*, 1879, p. 478.

opened into, the right Fallopian tube, which was greatly distended, thrown into convolutions, and filled with vesicles, some collapsed and others full of fluid.

Echinococcus colonies beneath the serous investment of the uterus are easily recognised during operation or at *post-mortem* inspection; but when the cysts are sterile their echinococcus nature is probably rarely recognised or even suspected.

(*b*) **The Mesometrium.**—Echinococcus cysts in this

Fig. 140.—Echinococcus Colony in the Pelvis. (After *Freund.*)
R, Rectum; U, uterus; B, bladder.

situation have been carefully studied by Freund,* and his account illustrated by admirable diagrams and drawings. He briefly relates a case which occurred in an unmarried woman, forty-five years of age, who came under his care in a very exhausted and wasted condition. She was suffering from a remittent form of fever, and had for several years complained of increasing difficulty in micturition and defæcation. For some months there had been pain in the pelvis, paralysis and œdema of the right leg.

* *Gynäkologische Klinik*, Strassburg, 1885, Bd. 1.

A tumour was detected on the right side of the pelvis, displacing the adjacent viscera; fluctuation was also detected over the right sciatic notch. This swelling was punctured with a trocar, and some foul-smelling fluid escaped. Eventually, a section through the pelvis (Fig. 140) revealed a suppurating echinococcus colony in the connective tissue of the right side of the pelvis, which had burrowed through the greater sciatic notch into the buttock.

The section represented in Fig. 141 is also from a case by

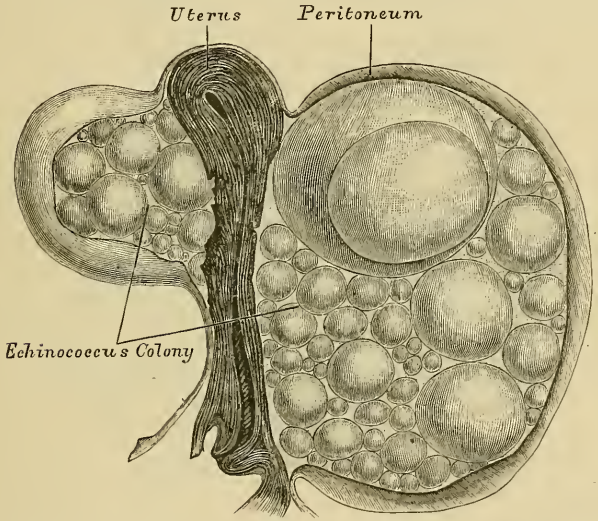

Fig. 141.—Echinococcus Colony in the Mesometrium. (After *Freund.*)

Freund. The patient was a badly-nourished girl, twenty-two years of age, whose subserous tissues seemed to have been subject to a general invasion of these parasites; they were found in the liver, spleen, omentum, pelvic connective tissue, and in the meso-colon. The relation of the echinococcus colonies to the subserous tissue of the mesometrium was admirably shown in sagittal section of the pelvis.

Hydatid cysts of the pelvis sometimes discharge themselves into the rectum, vagina, or bladder; and Freund details one case in which the vesicles escaped at various times by each of these passages in the same patient.

When the characteristic vesicles, membranes, or hooklets

escape either spontaneously or secondary to puncture of a cyst, the diagnosis is simple. The difficulty is in recognising sterile or barren echinococcus cysts, especially when large.

The occurrence of suppuration in sub-peritoneal pelvic cysts is due to the fact that they encroach upon mucous canals, such as the rectum, vagina, or intestine, and this

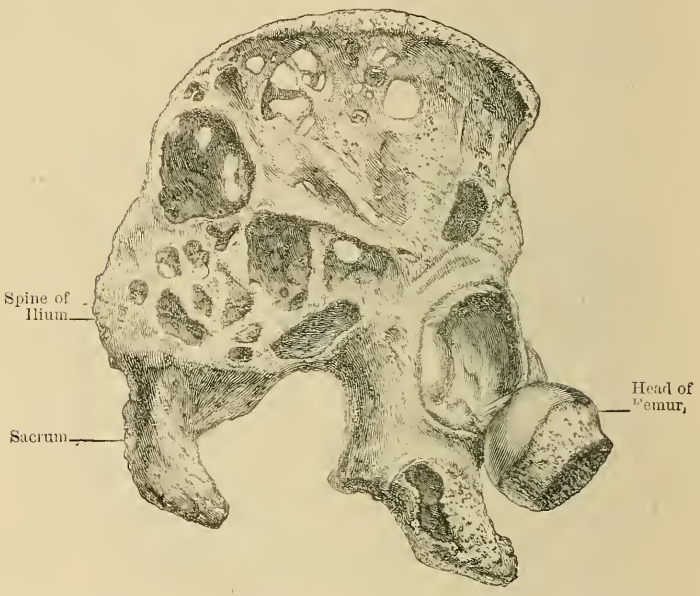

Fig. 142.—Innominate Bone eroded by Echinococcus Vesicles. (After *Targett.*)*

allows intestinal fluids and gases to invade the cyst, and produce decomposition.

(*c*) **The Bony Pelvis.**—Not the least interesting circumstance in connection with echinococcus cysts affecting the pelvis is the effect they exercise on the bones; firm osseous barriers offer little resistance to the invading propensities of echinococcus cysts, and they pass from the ilium into the sacrum, irrespective of the sacro-iliac synchondrosis. Hydatids of the ilium or ischium erode the walls of the acetabulum and over-run the hip joint, and when left to run their course unchecked will extend into the head of the

* Targett: Trans. Obstet. Soc., vol. xxxvi. p. 344.

femur. Some notion of the eroding powers of these cysts may be gathered from the pelvis sketched in Fig. 142.

(*d*) **Omental Hydatids.**—In the chapter on the differential diagnosis of ovarian tumours it was mentioned that a large echinococcus cyst in the omentum occasionally imitates an ovarian cyst. It is necessary here to draw attention to the fact that omental cysts of this character may, by their weight, drag upon the great omentum, especially when lodged near its free border, until they come to rest on the floor of the recto-vaginal fossa. As they enlarge, cysts under these conditions

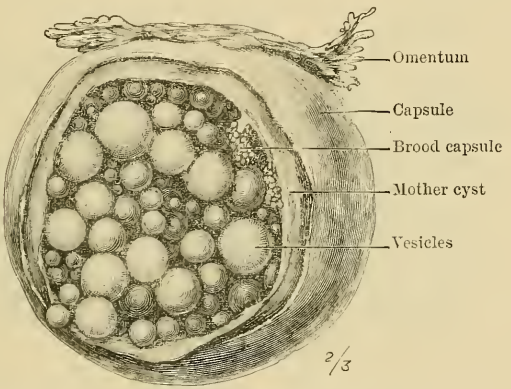

Fig. 143.—Echinococcus Colony, from the Omentum.

will become so tightly impacted as to produce dangerous pressure on the pelvic viscera.

In one such case under my care, the patient had the advantage of the opinions of several physicians and obstetricians, and they gave widely divergent diagnoses. At the operation the recto-vaginal fossa was occupied by five echinococcus cysts varying in size from a fist to a cocoanut (Fig. 143) tightly wedged together. There were several cysts in other parts of the omentum. In this instance the cysts were removed by enucleation. The spurious capsule was incised and the mother cyst shelled out. The patient made an admirable recovery.

Secondary Peritoneal Infection.—In performing operations on echinococcus colonies abdominal surgeons have noticed minute cysts and miliary nodules scattered over the

peritoneum, particularly in the pelvic region. Many of these nodules show the lamination characteristic of echinococcus membrane, and occasionally hooklets will be detected.

This condition is due in all probability to the escape of fluid from an echinococcus cyst, either in consequence of rupture or leakage during tapping. Brood-capsules escape with the fluid and gravitating to the recesses of the pelvis, engraft themselves on the peritoneum (Fig. 144).

British literature contains very scanty records of pelvic hydatids. Freund's unique experience is attributed to the fact

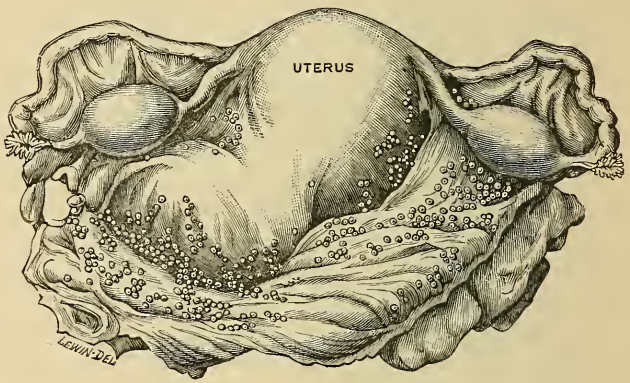

Fig. 144.—Infection of the Pelvic Peritoneum secondary to rupture of an Echinococcus Cyst of the Liver. (After *Graham.*)

that his observations were made in Silesia—a European region second only to Iceland in the frequency with which the inhabitants become infected by echinococcus. Australian surgeons ought to be able to add to our knowledge in this direction.

Diagnosis.—The clinical recognition of echinococcus cysts in the pelvic organs, mesometrium, or bones, is sometimes made by a sort of "lucky guess" when other and more common diseases can with certainty be excluded. Occasionally when a patient seeks advice for pelvic trouble and brings "vesicles" which have escaped by the rectum, vagina or urethra, much speculation is spared. When the bones are eroded and swellings form under the skin, they are punctured and characteristic fluid with vesicles and hooklets escapes, the diagnosis is established. When the cysts suppurate, the physical signs are those of abscess.

Treatment.—When the cysts take the form of pedunculated tumours, either of the omentum or uterus, they require the same treatment as ovarian tumours—namely, ligature and removal. When sessile, or their false capsules are very adherent, enucleation of the mother cysts is a very successful measure.

Should the cysts burrow in the mesometrium and open into hollow pelvic viscera, then the treatment of the suppurating cavities and tracks is very unsatisfactory and is rarely successful. The method of dealing with them should be on the same principle as that adopted for pelvic abscess. The course of the case is very protracted and death usually occurs from septic complications.

CHAPTER XLVIII.

THE DIFFERENTIAL DIAGNOSIS OF PELVIC SWELLINGS.

It may be useful briefly to summarise the leading clinical signs of the various "swellings" which occur in the female pelvis. It will be necessary to arrange them in two groups :—

1. Swellings which rise out of the pelvis and occupy the belly—abdomino-pelvic.
2. Swellings which remain in the cavity of the true pelvis —pelvic swellings.

Those which come under the first heading have been fully dealt with in chapters xviii., xix., and xx.

Pelvic Swellings.—Those which do not rise above the brim of the pelvis are only detected by vaginal or rectal examination: they give rise to pain and irregularities of menstruation.

Pain.—This may be constant or paroxysmal; when paroxysmal it may be provoked by:—

(*a*) Defæcation.
(*b*) Menstruation.
(*c*) Coitus.

Irregularities of Menstruation :—

(*a*) The flow is too profuse—menorrhagia.
(*b*) It may be too frequent—metrorrhagia.
(*c*) It may be arrested—amenorrhœa.

When any of the above symptoms are complained of by married women, a careful physical examination of the pelvic organs should be made. In the case of single women, judgment should be exercised before resorting to it.

If, in examination, an abnormal swelling is detected, it is necessary to determine whether it belongs to the uterus, mesometrium, Fallopian tube, ovary, or some adjacent structure.

(1) *The swelling is connected with the uterus;* it may be:—

(*a*) Early pregnancy.
(*b*) Retroverted gravid uterus.
(*c*) Retroflexed uterus.
(*d*) Hydro-, pyo-, or hæmato-metra.
(*e*) Myoma, impacted or free.

(2) *The swelling is unilateral or bilateral, and appears to be connected with the broad ligament.* It may be:—

(*a*) Cellulitis.
(*b*) Abscess.
(*c*) Hæmatoma.
(*d*) Gestation sac.
(*e*) Myoma.
(*f*) Echinococcus cyst.

Here the history and general condition of the patient are very valuable. If the trouble has followed abortion or delivery it is probably due to pelvic cellulitis, and a little watching and waiting soon enable a correct diagnosis to be formed.

When signs of suppuration are absent, and there is pain, some fulness of the breasts and a history of sudden pelvic pain, followed by collapse, mesometric rupture of a gravid tube may be entertained, if the age and environment of the patient are favourable to this event. Such cases are sometimes associated with irregular hæmorrhages and the expulsion of a decidua.

Myoma of the mesometrium cannot be diagnosed before operation from uterine myoma.

Immobility and pain in the swelling do not exclude the conditions of Group 1, because small ovarian dermoids are apt to be adherent and very painful, and myomata are occasionally so firmly impacted as to be immobile.

(3) *The swelling is not connected with the uterus or mesometrium.*

A. It may belong to the ovary, and be:—

(*a*) An inflamed ovary.
(*b*) A small ovarian tumour.
(*c*) A small parovarian cyst.

Or B. *Some affection of the Fallopian tube:—*

(*a*) Hydrosalpinx.
(*b*) Pyosalpinx.
(*c*) Gravid tube.
(*d*) Tubercular tube.
(*e*) Tumour of the tube (myoma, adenoma).

It is difficult to formulate rules for discriminating between these conditions, but in a general way it may be stated that if the tumour be mobile, cause little pain except when pressed, and produce no disturbance of menstruation, it is exceedingly likely to belong to Group A.

In tubercular salpingitis there is amenorrhœa, and usually evidence of tubercle in other organs.

In tubal pregnancy temporary amenorrhœa is the rule, followed by irregular bleeding from the uterus.

When Fallopian tubes are so enlarged as to rise above the brim of the pelvis, they are apt to be mistaken for ovarian tumours. When ovarian tumours are so small as to be restricted to the true pelvis, they are very apt to be regarded as distended tubes.

(4) *The swelling is unconnected with uterus, tubes, ovaries, or mesometrium.* It may be:

(*a*) Fæces in the rectum.
(*b*) Cancer of the colon or rectum.
(*c*) Kidney in the hollow of the sacrum.
(*d*) Tumours of the pelvic bones.
(*e*) Post-rectal dermoids.

All these conditions have been mistaken for diseases of the ovaries or uterine appendages, and cœliotomy has been performed under this impression.

Part V.

METHODS OF PERFORMING OPERATIONS FOR OVARIAN AND TUBAL DISEASE.

CHAPTER XLIX.

OVARIOTOMY.

Ovariotomy *signifies removal through an abdominal incision of cystic and solid tumours of the ovary, cysts of the parovarium, and ovarian hydroceles.*

Preparation of the Patient.—It is a great advantage, when it can be carried out, to keep the patient confined to bed two or three days immediately before the day of operation. She should be prepared as for any other serious surgical proceeding; the rectum could be emptied by means of enemata, and the patient should be strictly enjoined to take no food for several hours before the operation; this diminishes the chances of vomiting.

It is a great advantage to operate in the early morning, the patient should take a light meal about eight o'clock the preceding evening, and then abstain from food or drink until after the operation. In young patients this causes no inconvenience, but in elderly women it is necessary to modify it by allowing some milk or a cup of tea in the early morning.

Before the surgeon's arrival the nurse prepares the patient. She should simply wear a clean linen nightdress, warm stockings, and a pair of plain flannel drawers. Just before entering the room the bladder should be emptied naturally or by means of a catheter. In the meantime the surgeon and his assistant prepare the instruments.

In addition to the ordinary instruments, such as knives, forceps, needles, sutures, etc., required in surgical operations generally, the following will be needed :—A pedicle-needle and silk of various thicknesses for tying the pedicle, an ovariotomy trocar for tapping the cyst, strong and trustworthy forceps for seizing the cyst wall or pedicle, a clamp, or a serre-nœud, transfixing pins, and glass drainage-tubes of various sizes.

The instruments should be furnished with metal handles so that they may be immersed in the steriliser.

Sponges and forceps should always be counted before the operation, and the number written down.

It will be found convenient to have a routine number of sponges. I find six small and two flat sponges sufficient.

The water in which the sponges are immersed must be about the ordinary temperature of the body. The fluid used for the immersion of instruments varies with the fancy of the operator. Equally good results in practised hands follow the employment of tepid water or solutions of carbolic or boracic acid. It will be wise for beginners to employ strict antiseptic precautions, and then modify them as they acquire experience.

The spray is a useless and not altogether harmless encumbrance.

The Nurse.—Success in ovariotomy depends in no small measure on the nursing. It is therefore desirable to employ a nurse who has had special training in "ovarian nursing." The most trustworthy nurses are those who love their work and willingly carry out implicitly the instructions of the surgeon. They must be able to pass a catheter or administer an enema without causing the patient pain; to understand the administration of liquid food in regular quantities and at fixed intervals; and above all things they must not be chatterers.

The Room.—The selection of a room for ovariotomy is made on the same principles as for other major operations of surgery. In hospital practice it is the fashion to perform ovariotomy in a special room. This is quite unnecessary; I operate in the theatre, and treat the patient in a general ward with the most satisfactory results.

The Table.—In arranging the table, it is necessary to place beneath the sheet or blanket on which the patient lies a broad piece of waterproof material. Many surgeons cover the patient's abdomen with a sheet of waterproof with a large hole cut in the centre. This serves to protect the patient's clothes, but it is cumbersome. A table which admits of the patient being placed in what is known as Trendelenberg's position is sometimes very useful. This consists in raising the pelvis and lowering the head and shoulders, so as to allow the intestines to fall towards the diaphragm. This position is of very great advantage in removing small adherent cysts and ovaries from the recesses of a deep pelvis.

Anæsthesia. — Some surgeons advocate ether, others chloroform; each has its advantages and disadvantages. On the whole, I prefer chloroform, the patient being first rendered unconscious by nitrous oxide and ether. This saves time and often struggling.

The Abdominal Incision.—The patient being completely under the influence of the anæsthetic, the pubes should be shaved, unless the nurse has done this previously. The surgeon, standing on the right-hand side of the table, the assistant being opposite him, divides the integuments in the middle of the abdomen, beginning a little below the umbilicus, and extending it downwards to the symphysis. As a rule, the first incision is about 7 cm. in length, and should extend through the skin and subcutaneous fat to the linea alba. Any bleeding vessels are immediately secured with forceps. The linea alba is then incised, and usually the sheath of the rectus of one or other side is opened. It is easy to find the median strip of fibrous tissue; and care should be exercised in this, for if the surgeon fumbles about among the fibres of the rectus, he will be troubled with the small arteries belonging to that muscle. After dividing the sheath of the rectus, the sub-peritoneal tissue is exposed. This varies considerably in amount: in spare subjects it is little more than a delicate layer of connective-tissue; in fat subjects it may be very thick and granular, resembling omentum.

At this stage the urachus may sometimes be recognised,

and occasionally the bladder is spread out over the floor of the incision. An experienced operator quickly recognises the tissue of the bladder, but it may puzzle an inexperienced surgeon; it has been opened by the scalpel, especially when, as is sometimes the case, it is pushed upwards by a pelvic tumour. The peritoneum is now exposed, and in order to open this without injuring the cyst or the intestine, a fold of it is picked up with dissecting forceps and cautiously pricked with the point of the scalpel; air immediately occupies the cœlom.

Dividing the peritoneum is an important step in the operation. It may adhere to the tumour, and be cut through before the surgeon is aware of it, in which case he is apt to incise the cyst wall, mistaking it for peritoneum, and will be suddenly apprised of his error by the fluid gushing forth. When there is free fluid in the abdominal cavity, it will flow out when the peritoneum is divided, and the operator may for a moment think he has opened the cyst. A more serious error is to mistake peritoneum for cyst wall, and set about detaching it from the parietes. As soon as the peritoneum has been incised, the edges should be held by pressure-forceps, whilst it is divided to an extent nearly equal to the skin wound. This may be done with a scalpel and director, or scissors, or a probe-pointed bistoury, using two fingers as a guide. Should the cyst be pricked so as to allow of the fluid escaping, the cut edges should be immediately seized with forceps and drawn out through the wound.

The peritoneal cavity being opened, the operator recognises the bluish-grey glistening surface of the ovarian cyst, and then inserts the fingers, and sweeps them over the wall of the tumour to ascertain the existence or absence of adhesions.

Instead of the typical ovarian cyst, he may find a condition of things which requires investigation before proceeding farther. The tumour may be solid or uterine in origin; the escape of bloody fluid and small secondary knots on the parietal peritoneum, omentum, and intestines may suggest malignancy. The adhesions may be so numerous and firm that he hesitates to continue the operation.

It is of the highest importance to be satisfied as to the nature of the tumour; to plunge a trocar into a pregnant uterus, or a uterine tumour, is an accident which involves the operator in anxious difficulty.

Decomposing fluid, tenacious mucus from a ruptured cyst, or blood, may obscure the parts. Such may be washed away by irrigating the cavity with water at 110°. This is far more satisfactory and much quicker than sponging, and has the advantage of not fouling the sponges.

Much free blood in the belly suggests rupture of a gravid tube, tubal abortion, or secondary rupture of a gestation sac. More rarely it is due to rupture of an ovarian cyst secondary to twisting of the pedicle.

Emptying the Cyst.—Feeling satisfied that the tumour contains fluid, and is unconnected with the uterus, the operator proceeds to tap it. The trocar is thrust into the cyst, and the fluid rushes through it to the receptacle beneath the table. As the cyst collapses, the sharp edge of the trocar is rendered harmless by drawing it into the cannula; the cyst wall is seized with forceps, and drawn into the grasp of the spring hooks on the side of the trocar, and secured. As the cyst collapses, it is gently withdrawn through the incision, whilst the assistant keeps the abdominal wall closely applied to the cyst, and follows its subsidence by gentle pressure; as the last part of the cyst passes through the incision he prevents the intestines from escaping by the prompt application of a sponge.

Tapping a cyst is not always so simple. The cyst may contract up to a point, and the fluid cease to flow; this may be due to a large secondary cyst. The trocar may then be protruded from the cannula, and used to tap it. In some cases the fluid, when thick and viscid, flows with difficulty, or the tumour may be multilocular; under such conditions, the operator removes the trocar, enlarging the opening in the cyst, inserts the hand, and then proceeds to break down the interior of the tumour, until its bulk is sufficiently reduced to allow of its escape through the abdominal wound, unless retained by adhesions.

Adhesions.—Although the surgeon may have had reason to suspect the presence of adhesions, frequently he finds

none, and at other times, when he least suspects them, many exist. The most frequent adhesions are omental; they are usually seized with forceps, ligatured with gut and then divided.

Large portions of *great omentum* may require ligature; instead of being tied in a bunch, it should be transfixed with an aneurysm needle, armed with a piece of gut doubled, and the omentum tied in two, three, or four places, according to its width and thickness. Adherent *appendices epiploïcæ* are easily dealt with, but *intestinal adhesions* require care and patience; it is sometimes an advantage to dissect away a piece of cyst-wall with the gut rather than run the risk of tearing it whilst separating firm adhesions. They are rarely tough, and may generally be detached, and if any vessel bleed it should be carefully secured.

The *vermiform appendix*, if firmly fixed to the tumour, may be encircled with gut, tied firmly, and cut through; this is a safer plan than tearing, or otherwise damaging it in the process of detachment.

Should the intestines be torn the wound must be sewn up by a continuous suture of fine silk.

Adhesions to *parietal peritoneum* are best detached with the finger, and a sponge applied to check oozing.

When adhesions are extensive it may be necessary to enlarge the wound, especially when the cyst is adherent to the pelvic peritoneum, as the iliac veins, vena cava, or ureters are liable to be torn.

The Pedicle.—When the tumour is drawn out of the abdomen the pedicle is in most cases readily recognised, the Fallopian tube being an excellent guide to it. The tissues constituting the pedicle of an ovarian tumour are the Fallopian tube and adjacent parts of the mesometrium, containing the ovarian artery, pampiniform plexus of veins, lymphatics, nerves, and ovarian ligament. When the tissues are not matted together the round ligament is readily seen, and should not be included in the ligature.

In tying a healthy pedicle, the aim should be to transfix the mesometrium at a spot where there are no large veins, and tie the structures in two bundles. The *inner* half

contains the Fallopian tube, a fold of the mesometrium, and occasionally the ovarian ligament; the *outer* usually consists of the ovarian ligament, veins, ovarian artery, lymphatics, and a larger fold of peritoneum than the inner half.

Pedicles differ greatly; they may be long and thin, or short and broad. In some instances they are wanting, and in the case of *double-fused cysts* two pedicles exist.

Before tying the pedicle the surgeon examines its relation to the uterus, ascertains its freedom from adhesions, and the existence or otherwise of twists.

Long and thin pedicles are easily managed; the assistant supports the tumour firmly, but without dragging, or the tissues may be torn. The surgeon, with the thumb and index of the left hand, spreads out the tissues, and then transfixes them with the pedicle needle armed with silk. The loop of silk is seized as soon as it appears on the opposite side, and the needle withdrawn.

Care must be taken during the transfixion not to prick any adjacent coil of bowel, and not thrust the needle through the pedicle to an unnecessary extent. The threads must now be tied; for this purpose the loop of silk is cut with scissors, so that two ligatures lie in the pedicle.

The proper ends of each piece of silk are secured, and the thread intended for the outer half of the pedicle is made to cross that intended for the inner half. The threads are then tied firmly; the outer half should be secured first. The particular knot employed is of little consequence, so long as it is one that will hold firmly. In tying the threads some little care is necessary; it should be done with steadiness and firmness; any jerking is apt to break the silk and cause trouble, besides the risk of lacerating the tissue of the pedicles; whereas, if the parts are not tightly embraced by the silk, they will slip out of the ligature and begin to bleed. When this happens, after the wound has been closed and the patient returned to bed, it leads not infrequently to fatal consequences. In order to avoid this, there are certain points which need attention.

When the pedicle is thin the method just described is quite a safe way of applying the ligature, but with this precaution: as the surgeon ties the knot the assistant must

gently relax the parts by supporting the tumour without allowing it to drag on the pedicle.

After tying the ligatures the ends of the thread should be shortened, otherwise an incautious assistant, by pulling on them may drag the ligature over the cut surface of the stump.

The **knots** employed to secure the threads are various: a properly applied reef-knot answers all practical purposes, and is as simple as it is efficient. It may be necessary in some cases for greater safety to bring the two ends of the inner thread around the entire pedicle, and tie them again, taking care that the threads lie in the groove formed by the ligatures already applied. In practising this manœuvre, it is advisable to fasten the inner thread with three knots instead of two, for if the ends should be crossed over the knot it may be loosened instead of tightened. The plan of tying the pedicles in two pieces, and then encircling it with a separate thread, is not be recommended.

After the operator has gained some experience in this simple mode of tying the pedicle, he may then, if he thinks it desirable, practise other methods.

After securely applying the ligature, the tumour is removed by snipping through the tissues on the distal side of the ligature with scissors. Care must be taken not to cut too near the silk, or the stump will slip through the ligature; on the other hand, too much tissue should not be left behind. The stump is seized on each side by pressure forceps, and examined to see that the vessels in it are secure; it is then allowed to retreat into the abdomen. Should it commence to bleed, it must be re-transfixed and tied below the original ligature.

Occasionally a broad short pedicle will contain so much tissue that it will be necessary to tie it with three threads. To do this, the pedicle is transfixed with the silk, the loop is divided, and the two threads are interlocked. The outer thread is tied as usual. The needle is refilled with a single ligature, and transfixion performed. The needle is then unthreaded, and the untied end of the silk belonging to the first ligature is passed into the eye of the needle, which is then withdrawn. The second ligature, before it is tied,

must be interlocked with the third thread. When the threads are tied they will hold the tissues firmly.

It is impossible to frame absolute rules for ligaturing the pedicle. In this, as in all departments of surgery, common sense must be exercised, and at the present day, when ovariotomy is practised so widely, no one would think of performing this operation without assisting, or watching its actual performance by, an experienced surgeon.

In a few rare cases the pedicle may be so tightly twisted, or so attenuated by the dragging of the tumour, that it will only require encircling with a simple ligature without transfixion.

In those rare cases in which the tumour has been gradually detached from its uterine connections, it has no proper pedicle. Unless the operator is aware of this he may be exceedingly puzzled. Sometimes the tissues of the pedicles are inflamed; they are then so soft that they easily lacerate when the ligatures are drawn tight. In double-fused ovarian cysts two pedicles require ligatures.

Preparation of the Silk.—It is of the greatest importance that the silk used for the pedicle should be thoroughly aseptic. The method which has given me the best results consists in boiling plaited silk for twenty minutes in a steriliser and then preserving it for use in a solution of carbolic acid (1 in 20).

Sessile Cysts lying deeply between the layers of the mesometrium cannot be treated in this way. The surgeon taps the cyst, and finds that as the fluid escapes he cannot draw the tumour through the wound; he then proceeds to enucleate it in the following manner:—It is usually necessary to enlarge the abdominal wound; the capsule of the cyst, formed by the thickened peritoneum, is torn with dissecting forceps, or scraped through with a knife until the cyst wall is exposed, then with the fingers the connective-tissue between the cyst and its capsule is detached, taking every care not to lacerate the capsule; any bleeding vessel is immediately seized with forceps. In this way the cyst is easily shelled out of its bed. In some cases the cyst wall is so firmly held in the floor of the pelvis that it involves too much risk to remove it. Sometimes the base

of the cyst when held in this way may be transfixed and tied. As soon as the cyst is removed all bleeding must be immediately checked. The treatment of the capsule varies. Sometimes it is possible after enucleation of moderate-sized tumours to gather the loose capsule into a fold, transfix, and ligature it like an ordinary pedicle. When the tumour is large and has burrowed deeply this should not be done, as oozing takes place in the recesses of the cavity, and will sometimes form a large hæmatoma. To prevent this the edges of the capsule are stitched to the lower extremity of the abdominal wound and drained. It occasionally happens that an attempt is made to enucleate a cyst, but its deeper parts are so firmly attached as to cause the surgeon to desist. In such cases the edges of the cyst and capsule are stitched to the abdominal wound and its cavity is drained.

Cauterising the Pedicle.—This method of dealing with the pedicle is carried out in the following way:—As soon as the tumour is removed the pedicle is secured in a cautery clamp and screwed up tightly. The portion of the pedicle on the distal side of the clamp is then divided by a cautery iron at a dull red heat: the cauterisation is performed slowly and completely. The clamp is then cautiously relaxed, and should any spot bleed the clamp is screwed up again and the cautery re-applied. When the clamp is finally released the pedicle has a shrivelled, translucent, parchment-like appearance. It then retreats into the pelvis. The time occupied in cauterising a pedicle varies from five to ten minutes.

This method, introduced by I. Baker Brown, was attended with such success that in his practice the mortality fell to one-half of that attending the employment of the clamp. It was brilliantly successful in the hands of Thomas Keith, but the ease and rapidity with which a pedicle is ligatured have caused the cautery to be abandoned.

Having safely disposed of the pedicle, any blood that has found its way into the abdominal cavity is now carefully removed by gentle sponging. The surgeon then examines the remaining ovary: should it be found obviously diseased, he removes it. Partial removal of a diseased ovary, advocated by a few, is open to many objections. A small, clean, flat sponge is now placed over the intestines which are in relation

with the wound. *Instructions should now be given to count the sponges and forceps.*

Closure of the Wound.—This is effected by what may be called the "single" or by the "triple" method.

In the **Single Method** the sutures, either of sterilised silk or silkworm gut, are passed through all the layers of the abdominal walls. It is best to commence at the upper angle of the wound. The sutures should be inserted at intervals of 1·5 cm., and must be parallel to each other. In passing the suture the needle should traverse the peritoneum, then each layer of the aponeurosis of the rectus muscle, and lastly the integument, the needle emerging about 1 cm. from the margin of the wound. When sufficient threads have been inserted they are gathered up on each side of the wound and grasped with forceps, or each suture may be secured temporarily with forceps, as soon as it is passed.

Before proceeding to fasten the sutures they should be carefully drawn aside, and a sponge in the sponge-forceps, or on a holder, carefully introduced into the recto-vaginal pouch. This *tell-tale* sponge indicates the existence of oozing, and if it comes up quite clean all is well, and the wound may be closed. Should the sponge return bloody, the pedicle is examined and any bleeding point immediately secured. This is an important rule:—*Never close the abdominal wound without using the tell-tale sponge even in what appears to be the simplest case.*

Some of the sutures are now tied, and then the protecting sponge is withdrawn and the wound completely closed. The mutual pressure of the cut surfaces restrains hæmorrhage, and it is never needful to ligature vessels in the wound. The skin edges are carefully co-apted, and should they gape, a few superficial sutures may be inserted. In tying the deep sutures the aim should be to fasten them with sufficient firmness to keep the parts in apposition; excessive tightness interferes with union. The free ends of the sutures are cut away.

The Triple Method.—This consists in suturing each layer separately. The peritoneum is first secured by a continuous suture of catgut or fine silk. The sheath of the rectus is

then brought together by a continuous suture of catgut or interrupted silkworm gut. Lastly, the skin is secured by interrupted sutures of silk or other material according to the fancy of the operator. The great advantage of the triple method is that it minimises the risk of a yielding cicatrix.

Dressing.—The simplest mode of dressing, and one I employ with the happiest results, is to apply a double fold of boric lint to the wound; over this is arranged a pad of charpie, and then two or three folds of absorbent cotton-wool. A flannel binder is then adjusted, and fastened firmly with safety-pins. This dressing is rarely touched before the seventh day, and then alternate sutures are removed. The remainder are withdrawn two days later, and the wound is usually found soundly healed.

If it is the fashion of the surgeon to employ antiseptic rather than aseptic principles, he will use carbolic gauze, oil-silk, or other materials, according to the principles of true Listerism. When the case is one in which the surgeon deems it necessary to resort to *drainage*, the final stages of the operation are somewhat modified. (*See* chapter li.)

It is not too much to state that success in ovariotomy depends in a large measure upon *decision* on the part of the surgeon; he should also exercise *care* even in apparently trifling matters of detail; there should be no unnecessary manipulation of the parts, no fussiness, but extreme *gentleness* and the most scrupulous *cleanliness*, and the operation should be conducted with as much *expedition* as is consistent with thoroughness. The exhibition of these qualities always indicates an experienced and successful operator.

Clumsy and injudicious operators always attribute their failures to nurse, sponges, surroundings, or even the patient. All such should remember what Keith* wrote: "For my own part, when a case goes wrong after an operation I have seldom to look far beyond myself for the cause of failure: something done, something not done. This is a lesson hard to learn. We blame persons, things, accidents, and circumstances rather than ourselves."

Incomplete Ovariotomy.—In the course of an ovariotomy

* *Brit. Med. Journal*, 1878, vol. ii. p. 590.

the operator may find it impossible to remove the cyst in consequence of its deep and firm adhesion to important structures in the pelvis. The hopelessness of the task may not be appreciated until after the contents of the cyst have been evacuated. Under such conditions the only course left to the surgeon is to stitch the edges of the opening he has made in the cyst to the margins of the abdominal incision and leave it to drain. This was at one time the usual method of treating ovarian cysts. It has been, and with good reason, long abandoned as a routine proceeding.

When a cyst has been stitched in this way to the abdominal wound, the walls of the cyst gradually suppurate, and the cyst is converted into an abscess cavity. Sometimes it will shrink to very small proportions, but rarely closes completely.

I have seen this method practised with irremovable adenomata and with dermoids. As a rule, the patients die slowly, exhausted by the continual discharge of pus, months, and in some cases two and even three years, after the operation.

Repeated Ovariotomy.—In a large number of cases patients have been twice submitted to ovariotomy. A knowledge of this fact always induces the surgeon, when performing ovariotomy, to examine carefully both ovaries, and when there is evidence of disease, to remove both glands. The second ovary must not be removed unless the surgeon feels very strongly that it is likely to give the patient trouble, for in very many cases women have become mothers after ovariotomy, and given birth to twins, and even triplets. This fact is sufficient to prohibit the removal of both ovaries as a constant practice in ovariotomy.

The records do not show that a second ovariotomy is attended with more than the usual risk of a first ovariotomy. It is necessary to remember that the abdominal incision must be cautiously made, because in very many instances intestine may be adherent to the cicatrix, and under conditions rendering it very liable to be wounded. It must also be remembered that the cicatrix is often very thin, and the knife may do much mischief to the intestine before the surgeon is aware of it.

It is recommended by some writers that in a second ovariotomy the opening may, with advantage, be made a little to one side of the original incision.

Cases have been reported in which patients have been three times submitted to ovariotomy; it is, of course, impossible that an ovarian cyst was removed on each occasion. That tumours were removed there can be no doubt, but it does not necessarily follow that they all originated in the ovary. The idea that the patient possessed three ovaries, each of which became cystic, is pure assumption.*

Anomalous Ovariotomy.—In a few instances, chiefly due to erroneous diagnosis, ovarian tumours have been successfully removed through an incision in the linea semilunaris (R. W. Parker):† the ilio-costal space (Le Bec),‡ the vagina (Berry and others), § and the rectum (Stocks). ||

The after-treatment.—The patient is returned to bed with gentleness, to avoid vomiting; a pillow is placed under her knees, and if there is evidence of much shock a hot-water bottle should be applied to the feet, remembering that the patient is unconscious, or she will run the chance of having the feet blistered unless the nurse exercises due watchfulness.

In a short time the patient recovers consciousness and complains of pain; as a rule there is vomiting, the result of the anæsthetic, and thirst.

When the pain is very severe a quarter of a grain of morphia may be given in the form of a suppository, a few hours after the operation; should the pain continue, this may be repeated in the course of six hours. In many cases no opium is required, and the routine use of this drug is, to say the least, injudicious.

Vomiting.—This result of the anæsthetic is sometimes troublesome. It is best avoided by keeping the stomach empty for twenty-four hours. To relieve the thirst the patient is allowed to wash the mouth with cold water, but on no account to swallow it.

* *Brit. Med. Jour.*, 1891, vol. ii. pp. 118 and 336.

† *See* page 176, Table B, No. 23.

‡ *See* page 160.

§ *See* page 182.

|| *See* page 183.

Young patients easily bear this apparently prolonged fast, but in the case of patients exhausted by disease, prolonged operation, or loss of blood, abstinence of this character would be disastrous. Under such conditions a nutrient enema, consisting of beef-tea or milk, with a small quantity of brandy, administered at intervals of six hours, is most useful. Should it be necessary to prescribe opium in such cases, twenty drops of tincture of opium may be added to one of the enemata.

At the end of twenty-four hours small quantities of barley-water or milk and water should be given, and if retained, then milk is given more frequently, and subsequently beef-tea. If at the end of three days no untoward symptoms arise, chicken jelly, pounded chicken, or boiled fish is allowed, and the patient soon gets well enough to take convalescent diet. No precise rule can be formulated for dieting patients: some cannot take milk, others reject beef-tea. My custom is to keep them on milk diet for three days, and if there be no vomiting, then try solids cautiously. When vomiting is troublesome with liquid diet, this may be suspended for several hours, and nutrient enemata substituted.

When vomiting continues more than twenty-four hours after an operation, especially when accompanied by an increased frequency of pulse and distension of the belly, it is usually an unfavourable sign. Slight vomiting, with no distension and a normal pulse-rate, need not occasion alarm.

The Bladder.—For the first twenty-four hours the urine is drawn off by the nurse by means of a soft catheter. This instrument, when not in actual use, must be kept in clean water or mild antiseptic solution. The catheter should be thoroughly syringed and washed each time it is used; before passing it the nurse should wipe away the mucus around the urethral orifice, so as to avoid carrying infection into the bladder. Even with a thoroughly trustworthy nurse it is well to be suspicious of the catheter, and it is a safe plan to encourage the patient, after the first day, to pass water by her own efforts. Unfortunately, many women cannot micturate when lying on their backs. Cleanliness and care with the catheter must be strictly enforced; cystitis causes much misery.

Temperature.—This should be observed every four or six hours, and duly recorded in the note-book. The first record after the operation is usually subnormal, and in twelve hours becomes normal, and may even be raised half a degree. During the first twenty-four hours it may ascend to 100° without causing alarm; beyond this, especially if accompanied by a rapid pulse, an anxious face, and distended belly, it is sufficient to make the surgeon anxious. A temperature of 101° or 102°, unaccompanied by other unfavourable symptoms, is not a cause for alarm unless maintained.

Pulse.—This is a valuable guide, and even more trustworthy than the temperature. When the pulse remains steady and full there is no cause for alarm. When it increases in frequency to 120 or 130 or more beats in the minute, is thin and thready, then there is danger even with the temperature only slightly raised.

Distension of the abdomen is due to the accumulation of gas in the intestines. It is usually first observed in the transverse colon. It occasions in some cases much discomfort, and it is not always easy to relieve it. The passage of the rectal tube is useful, or the administration of a simple enema. A saline purge is recommended by some surgeons.

Metrostaxis.—After operations for the removal of both ovaries and tubes blood sometimes escapes from the uterus and simulates menstruation. It usually occurs within the first forty-eight hours after the operation. Metrostaxis occurs in about one half the cases, and has nothing to do with menstruation.

Bowels.—At the end of four or five days the bowels will occasionally act of their own accord. Usually, however, it is necessary to use a simple enema; and this is, in the majority of cases, quite efficient. When opium has been freely administered, still more active measures may be required.

Sutures.—On the seventh or eighth day the sutures will require removal. It is a good plan to allow two to remain (taking care not to leave those that are causing irritation) twenty-four hours longer. After removing the sutures a broad band of adhesive plaster should be firmly fastened across the abdomen, with a good grip on each hip. This

precaution is necessary, as an incautious or violent movement, such as coughing or straining, may cause the skin edges of the wound to gape.

Should suppuration or stitch-hole abscesses occur—and these are rare—they must be treated on general principles. *Erysipelas* may attack the abdominal wound and retard convalescence.

Bedsores may give trouble after ovariotomy in an elderly and enfeebled patient, as after any other surgical procedure which requires the patient to remain for several consecutive days upon her back. With due care and watchfulness on the part of the nurse a bedsore should not occur.

CHAPTER L.

OÖPHORECTOMY.

Oöphorectomy *signifies the removal through an abdominal incision of the ovaries and Fallopian tubes, for affections mainly inflammatory; also the removal of healthy ovaries and tubes to anticipate the menopause.*

The term is open to much criticism; so are many other names in common use in surgery.

This operation is performed for the relief of a variety of diseases connected with the internal generative organs.

(i) **Tubal diseases,** such as:—

1. Pyosalpinx and tubo-ovarian abscess.
2. Hydrosalpinx.
3. Tubercular salpingitis.
4. Tumours of the tube: myoma, adenoma, carcinoma.
5. Gravid tubes.
6. Hæmatosalpinx.

(ii) **Ovarian diseases**; for example:—

1. Ovarian abscess.
2. Apoplexy of the ovary.
3. Hernia of the ovary.
4. Prolapse of the ovary.

(iii) **To produce artificial amenorrhœa** in such conditions as—

1. Uterine myomata.
2. Hæmatokolpos or hæmatometra.
3. Osteomalacia.

(iv) **In nerve troubles** oöphorectomy has been performed in order to *anticipate the menopause* in—

1. Hystero-epilepsy.
2. Epilepsy.
3. Some forms of insanity.

4. Dysmenorrhœa, unassociated with demonstrable disease of the ovaries.

The results of bilateral oöphorectomy in the neuroses classed in group iv. were described in chapter xxix., and the reader is again referred to it. The indications for operative treatment in groups i. and ii. have been fully dealt with in the early part of this book, and it is unnecessary to recapitulate them here. The results of an artificial menopause in the three conditions placed in group iii. have not been considered and it will be necessary to refer to them briefly here.

1. **Oöphorectomy for Uterine Myoma.**—It is a fortunate circumstance that this proceeding is followed by excellent results in those cases of uterine myomata which are the least suited for treatment by hysterectomy.

In my own practice I have had the best results in what are known as "impacted myomata"—especially myomata which become impacted immediately before the menstrual period. In such cases the uterus during the inter-menstrual period is easily accommodated in the true pelvis, and perhaps the crown of the tumour is perceptible to the hand when pressed upon the hypogastric region; the uterus moves freely without exerting dangerous or even inconvenient pressure. A few days before the onset of a menstrual period such a tumour becomes turgid—in some cases yields a loud venous hum—enlarges, compresses the urethra against the pubic symphysis, and causes retention of urine, necessitating confinement to bed and the systematic use of the catheter. When the menstrual flow is established the uterus diminishes in size, the "hum" ceases, and the urethra is released. The frequent recurrence of this obstruction eventually leads to hydronephrosis. The relations of such a tumour to the pelvic viscera are shown in Fig. 145.

Myomata of this type are difficult and dangerous, even in experienced hands, to remove, but after removal of the ovaries they rapidly shrink and cease to cause trouble. The conditions in uterine myomata favourable for oöphorectomy may be put in the form of an aphorism; thus:—

A myoma of moderate size in a woman between thirty and forty-five becomes impacted, and causes retention of urine at each menstrual epoch.

Oöphorectomy for uterine myoma has a limited application; it is also indicated in cases covered by the following clause:—

A myoma is the cause of serious and repeated bleeding,

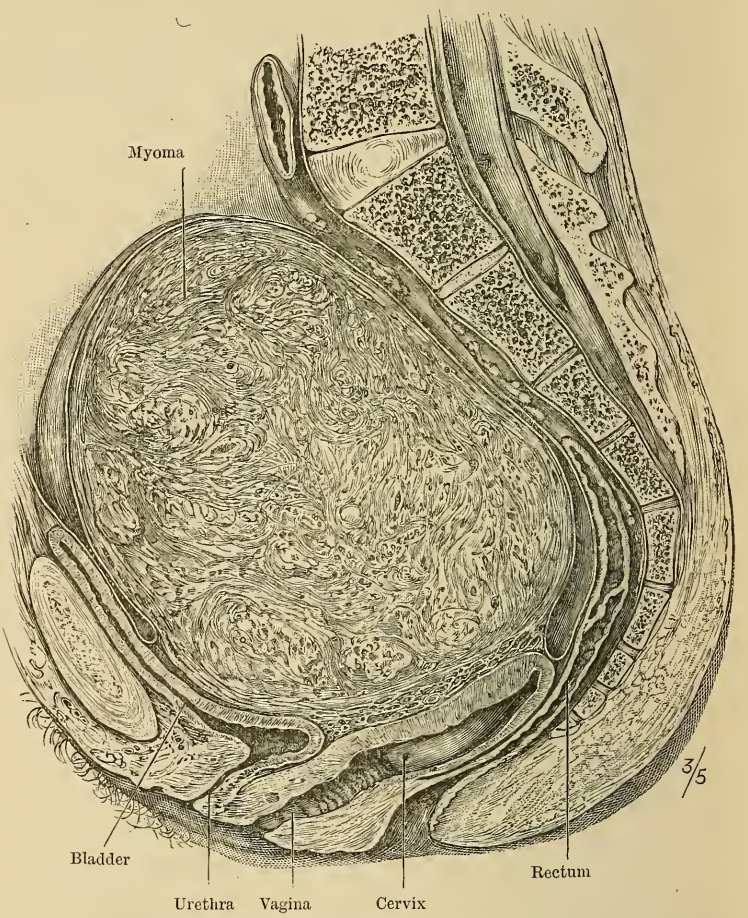

Fig. 145.—Sagittal Section of a Pelvis with a Uterine Myoma *in situ*. From a woman thirty-five years of age.

producing profound anæmia; the bleeding is uninfluenced by rest and the administration of ergot. When these troubles are not due to a pedunculated myoma projecting into the

uterine cavity, and the menopause cannot be reasonably expected for two or three years.

2. **Hæmatokolpos.**—Experience teaches that it is a surgical act of very great simplicity to evacuate the retained menstrual fluid in cases coming under the terms hæmatokolpos and hæmatometra; it is, however, a matter of difficulty in a large proportion of these patients to maintain the patency of the artificial opening. Hofmeier* and Terrillon† have suggested that in cases of "retained menses" where the usual methods fail, the production of artificial amenorrhœa would meet the difficulty.

As far as my inquiries have extended, I only know of one operator who has carried out this method. Dr. W. H. Fenton, in 1893, performed the usual operation on a girl eighteen years of age who was suffering from hæmatometra due to atresia of the vagina. Great difficulty was experienced in maintaining the artificial communication between the two sections of the vagina.

Four months later the opening had completely closed, and in order to meet the necessities of the patient, Dr. Fenton performed bilateral oöphorectomy. The results, immediate and remote, were very satisfactory.

3. **Osteomalacia.**—For at least a century physicians have been acquainted with this remarkable disease. Although excessively rare in the British Isles, it seems to be by no means uncommon in Switzerland. To obstetricians osteomalacia is of especial interest, inasmuch as it seems to be almost peculiar to women during the child-bearing period of life, its effects being intensified by successive pregnancies. Further, one of the characteristic features of osteomalacia is the marked distortion it produces on the pelvic bones, whereby the capacity of the pelvis is so narrowed that the extrusion of a viable child becomes impossible. The essential clinical facts, in addition to those already mentioned, consist of a decalcifaction of the bones, rendering them soft and pliable, and the presence in the urine of an excessive amount of phosphates. The disease seems to attack particularly the bones of the lower limb, pelvis, and

* "Grundriss der Gynækologischen Operationen 1892," p. 384.

† "Leçons de Clin. Chir.," 1889, p. 325.

lumbar vertebræ. In addition to the distortion and consequent mechanical interference with parturition and progression, these patients suffer agonising pain in the pelvis, back, and lower limbs.

In 1887 Professor Fehling,* of Bale, reflecting on the frequent restriction of osteomalacia to the child-bearing period of life, the intensifying effects of each pregnancy, and the menorrhagia associated with this disease, carried out the idea of treating these unfortunate women by bilateral oöphorectomy.

The results of this procedure have been very extraordinary and encouraging, and the operation is founded on sound principles. The course of the disease is arrested, the pains cease almost immediately, the output of phosphates undergoes marked diminution, and the patients become restored to active life.

In 1892 Kummer,† of Geneva, published an excellent paper on this subject, and in addition to a valuable and successful case under his own care, was able to construct a table of thirty-eight cases in which bilateral oöphorectomy had been performed for the cure of osteomalacia.

The mode in which the removal of the ovaries influences the course of osteomalacia caused much speculation of an unsatisfactory character. Happily, Professor Curâtulo ‡ has demonstrated by experiment that double oöphorectomy is followed by a remarkable decrease in the elimination of phosphates. This diminution may begin within six or eight days after operation, sometimes later, and lasts for three or four months. His experiments were carried out on bitches and mice.

These observations are sure to be followed up, as they seem to afford a clue to the nature of this very curious disease.

Oöphorectomy.—For the performance of this operation the patient is prepared in the same manner as for ovariotomy; and the instruments needed are much the same, except that the large trocar will not be required. It is in this operation

* *Arch. f. Gyn.*, 1890, xxxix.

† *Revue Méd. de la Suisse Romande*, 1892, No. 7.

‡ Trans. Obstet. Soc., vol. xxxviii.

that the Trendelenberg position is of great advantage. As a rule, the incision is longer than in simple ovariotomy, but the stages are identical until the abdominal cavity is opened. The subsequent stages of the proceeding are different. Not infrequently the surgeon finds, after dividing the peritoneum, the omentum adherent to the parietes, and it is necessary to separate it very carefully and cautiously, in order to gain access to the pelvic cavity. He then seeks the ovary and tube of one or other side; should he meet with difficulty in finding them, it is a useful plan to ascertain the position of the uterus and use it as a guide. In many cases the organs are recognised without the slightest difficulty, and are easily drawn up to the level of the wound; in others, recognition of the parts is difficult, and when their position is made out they may be so bound down by dense adhesions that they cannot be raised to the level of the incision. On meeting dense tough adhesions it is usual to insert a large flat sponge, in order to exclude the intestines from the pelvis, and then let the assistant carefully keep the wound open by means of broad retractors. In this way it will be possible to see the parts and, if necessary, illuminate the recesses of the pelvis by means of a reflector or electric light, which should exist in every well-appointed operating-theatre.

When the ovary and tube are sufficiently freed they are seized with a pair of large forceps. None are more useful for this purpose than those known as ovum- or sponge-forceps. The surrounding parts are protected by sponges and the pedicle transfixed by means of a pedicle-needle or an ordinary needle in handle, the greatest care being exercised that the instrument does not transfix or prick a piece of bowel which may be lying near, or adherent to the pedicle. The silk is then tied in the same manner as in ovariotomy. At the time of tying the ligature the assistant gently relaxes the grip of the forceps and the knot will be felt to tighten.

In many cases, especially with a well-trained and experienced assistant, the forceps are unnecessary, as he will be able to hold the parts with his thumb and forefinger.

When the tissues are soft, from long-standing inflammation, a clumsy assistant may, by injudiciously dragging on the

forceps, tear them. Unless the surgeon and assistant are accustomed to work together, the surgeon needs to be on his guard against excessive zeal on the part of the latter.

When a distended tube exists, and the fluid may be pus, caution in separating adhesions and raising it is very necessary; and in spite of care and skill, it happens that just at the moment of raising the tube into view, the wall of the cavity yields and the fluid escapes. This constitutes an additional reason for completely isolating the parts by means of sponges. The application of the ligature is often a source of anxiety; the infiltrated tissues are so soft in some cases that any undue force or jerking of the ligature will tear them and necessitate retransfixion.

When the ligature is satisfactorily applied the distal parts are cut away with scissors; the cut surface is then examined to ascertain that no inflamed or suppurating tissue is left behind. If this is the case, and it cannot be dissected out without endangering the ligatures, the parts should be retransfixed and tied.

When it has been found necessary to remove the ovary and tube on one side for inflammatory disease, experience teaches the necessity of removing the parts on the opposite side, or the operation will fail to be beneficial.

The remaining steps of the operation are conducted on the same principles as in ovariotomy.

When oöphorectomy is performed for the purpose of producing artificial amenorrhœa in cases of uterine myomata, it may occasionally be a relatively easy operation; but with very large tumours it is very difficult, and often impossible, to remove completely the ovaries and tubes.

The great danger of this operation with large tumours is due to several circumstances. In the first place, the broad ligaments and tubes are so stretched that when the parts are tied and cut away the tension upon the ligatures is so great that they slip off. When this happens in the course of the operation it is sometimes very difficult to discover and secure the vessels, and in very many cases it has been necessary to perform hysterectomy to control the bleeding. Should the accident happen after the patient has been returned to bed, it is in most cases fatal.

Not infrequently the ovaries and tube of one side are free and easily removed, but those of the opposite side are so embedded in the tumour, or the ovary may be elongated into a long rounded cord and embedded in the midst of a formidable plexus of veins, that its removal is impossible. This will nullify the operation, for the presence of even a portion of ovarian tissue is sufficient to ensure the persistence of menstruation. In carrying out the necessary manipulations within the abdomen every care must be exercised to prevent the least injury to the capsule of the tumour, for it bleeds very freely, even from the least puncture; as the tissues are exceedingly tense, it is no easy matter to arrest the hæmorrhage, except by the performance of hysterectomy.

When it is necessary to remove the ovaries for the production of an artificial menopause, the ampullary segment of the tube is removed also, because it simplifies the application of the ligature. This is sometimes termed salpingo-oöphorectomy.

In regard to oöphorectomy it may be stated:—

(1) It is usually more difficult, and attended with greater risk to life, than ovariotomy.
(2) In myomata the great danger is hæmorrhage.
(3) In pyosalpinx the risk arises in connection with the pedicle:—
    (*a*) it may slough and cause fatal peritonitis,
    (*b*) or cause a local abscess.
(4) The good effects expected will be prevented if only a portion of an ovary is left behind.

Salpingostomy is a conservative operation introduced by Skutsch,* of Jena. It consists in removing the fluid contents of a distended Fallopian tube by means of a Pravaz syringe, to ascertain its freedom from pus. The occluded ostium is reopened, the fluid allowed to escape, and a piece of the tubal wall cut away. The mucous and serous membranes are then united along the margin of the artificial opening by fine silk thread. A sound is then passed from the tube into the uterus.

The sequelæ of oöphorectomy are considered, with those of

* *Centralblatt für Gyn.*, 1889.

ovariotomy, in chapter xli. The *remote effects* of the removal of the ovaries are discussed in chapter xlii.

HISTORICAL.

Hegar (Freiburg), July 27th, 1872, removed the ovaries for intolerable neuralgia. The patient died.

Lawson Tait (Birmingham), August 1st, 1872, removed the ovaries to stop hæmorrhage in myoma of the uterus.

Battey (Rome, Georgia), August 17th, 1872, removed the ovaries for severe neuralgia.

Fehling (Bale), 1887, removed the ovaries in a case of osteomalacia.

Fenton (London), 1893, removed the ovaries to arrest menstruation in a case of hæmatometra due to atresia of the vagina.

CHAPTER LI.

IRRIGATION AND DRAINAGE.

Irrigation of the abdominal cavity is an exceedingly useful proceeding when there has been an escape of fluid, septic material, or extensive hæmorrhage previous to, or during the performance of, cœliotomy. The principle consists simply in washing out the belly cavity with warm water; the particular method matters but little.

In hospital practice the method I employ is the following:—The irrigating vessel is of glass, and capable of holding 2 litres of fluid. An indiarubber delivery-tube $1\frac{1}{2}$ m. in length and 2 cm. in diameter, furnished with a stopcock, is connected with the vessel. When an abdomen requires irrigation, the irrigator is filled with plain water at a temperature of 110° to 115° Fahr., determined by a thermometer kept for the purpose. It is necessary to be particular in this respect and never guess at the heat of the water according to the sensations imparted to the hands of the nurse or assistant. The patient is then turned a little to one side and a dresser or nurse elevates the vessel, and a steady, full stream flows through the tube. The surgeon introduces his left hand into the abdomen and restrains the intestines from being carried through the wound with the outflowing stream. The water, by means of the flexible tube, is conveyed to all parts of the abdomen, whilst the movements of the left hand among the viscera prevent clots from being retained in the various recesses. The tube must be directed deeply in the recto-vaginal pouch, so as to wash out blood lying in that situation, and also in the iliac fossæ. The water, which was at first discoloured by blood, pus, or serum, according to circumstances, quickly comes away clear, unless there is oozing or free bleeding. In this case, a little experience soon enables the surgeon to tell if it be of any extent, and he at once seeks for the spot whence the

blood comes. As soon as the water issues from the abdomen as clear as it entered, the irrigation is stopped, and the retained fluid is quickly taken up with sponges.

The reason for turning the patient to one side is to allow the water to flow to that side, and it is easily caught in some convenient receptacle. The large sheet of waterproof on which the patient is placed at the commencement of the operation keeps the bed dry, and is easily converted into a trough to collect any water, which may escape the smaller receptacle held by the assistant and direct it into a foot-pan under the bed. Irrigation may in this way be accomplished quickly, and without fuss or causing slop around the table.

When the surgeon is satisfied that the parts are clean, and he has sponged up the fluid in the pelvis, he should lodge two large sponges in the recto-vaginal pouch to soak up fluid as it trickles down from the loins or from among the coils of intestines whilst he introduces the sutures. By the time he has done this the peritoneum is usually dry, and he removes the sponges and closes the wound, unless it is a case demanding drainage.

In cases occurring in private houses where irrigation is necessary, the water may be poured into the belly from a large jug, taking care that it enters in a steady, full, but not forcible stream. The peritoneum may also be admirably irrigated by filling a large ewer with water and using a long and wide piece of drainage-tube on the syphon principle. In this, as in all other departments of surgery, much may be accomplished by the exercise of a little common sense. The surgeon should always remember the danger necessarily involved by the presence of large quantities of even weak solutions of such poisonous substances as carbolic acid or perchloride of mercury.

Plain water is the safest medium for irrigating the abdominal cavity.

Irrigation is always indicated when there has been much oozing from the separation of many adhesions, or an escape of pus, or the presence of much blood, as in rupture of an ovarian cyst, a gravid tube, or a tubal abortion. The proceeding is not limited to the needs of the

ovariotomist, but is of great use when operations are undertaken for ruptured viscera, etc.

Water at 110° to 115° F. is comfortably borne by the peritoneum, and at this temperature it does not cause shock, but cleanses the peritoneum, and acts as an admirable hæmostatic to oozing surfaces.

Irrigation does not of necessity entail the subsequent use of a drainage-tube, and in many instances renders its employment unnecessary.

Drainage.—After the removal of an adherent tumour, and after the various bleeding vessels have been duly ligatured, it occasionally happens that blood oozes from a number of capillary vessels too small, or in situations too inaccessible, to permit the application of a ligature. Such oozing is frequently arrested by irrigation. When the surgeon apprehends during the reaction a recurrence of the oozing he employs a drainage-tube.

When peritoneal drainage was first introduced, glass tubes were employed, but I find the ordinary indiarubber much more convenient and equally efficacious. The tube should reach to the bottom of the pelvis and project at the lower angle of the wound. The escaping fluid may be collected in a sponge adjusted over the orifice of the tube or be allowed to flow on to the dressing, or the nurse may be instructed to exhaust the tube from time to time by means of a syringe armed with a piece of rubber tubing. The tubing is inserted three-quarters of the distance down the drainage-tube, and as the nurse exhausts the syringe the exudation flows into it. The greatest care must be exercised to keep this syringe and tubing clean; when not being actually used, it should be kept immersed in whatever antiseptic solution the surgeon selects.

For the first few hours the tube requires frequent attention, especially when irrigation has been resorted to. The fluid first evacuated is deeply stained with blood, but gradually gets of a lighter tint and diminishes in quantity.

During the first twelve hours many cubic centimetres of blood-stained fluid require removal through the tube. During the succeeding twelve hours the fluid rapidly diminishes, and on the second day the tube should be removed. It

is impossible to formulate precisely the length of time the drainage-tube should be retained *in situ*. In some cases twenty-four hours are long enough, whilst others will require it sixty hours or more.

The following simple rules may serve as a guide to those who have had little or no experience of drainage:—

(1) As long as the fluid collects in the tube and is blood-stained, drainage must be continued.

(2) When the fluid which rises in the tube is free from blood or pus, remove the tube.

(3) When the fluid accumulates in the tube at the rate of 30 cm. in twelve hours, it may be dispensed with.

(4) When the tube is retained for more than one day, it should be moved a little and gently rotated: this prevents omentum from insinuating itself into the perforations of the tube.

Drainage is not only useful in enabling fluid to escape from the cœlom, but it acts as a sentinel, and gives warning of hæmorrhage.

When the abdominal wound is closed, the patient returned to bed, and reaction is established, the bleeding may be free. When this is the case, it escapes through the tube. Such conditions must be treated on the principles that apply to recurrent or intermediate hæmorrhage in other situations—namely, open the wound and search for the bleeding point.

Drainage is rarely necessary after ovariotomy. It is occasionally advisable when tumours have been enucleated from the mesometrium, especially when they have burrowed deeply. It is most frequently needed after the removal of a firmly adherent pyosalpinx with firm vascular adhesions deep in the pelvis, and in bleeding from gravid tubes.

The routine use of the tube is to be condemned.

The *disadvantages* of drainage must not be overlooked. The chief objections which have been urged are the following:—

(1) It retards the union of the wound.

(2) Drainage of the whole abdominal cavity is only possible during the first forty-eight hours, as the track of the tube becomes surrounded by adherent intestine.

(3) The admission of air may induce peritonitis or lead to the formation of a sinus.

(4) Ligatures are more likely to come away when drainage has been employed.

(5) When a glass tube is used, it is apt to press injuriously on the rectum and lead to sloughing.

(6) Omentum may insinuate itself in the openings of the tube and lead to difficulty when the tube is withdrawn.

(7) A yielding scar is said to be more common after the use of the tube.

When drainage is judiciously employed, the good results overbalance these disadvantages.

CHAPTER LII.

THE RISKS OF OVARIOTOMY; IMMEDIATE RISKS.

The performance of ovariotomy and allied operations is attended by several risks. This chapter will be devoted to the consideration of the immediate risks. These are:—

(1) Shock.
(2) Injury to viscera.
(3) Hæmorrhage.
(4) Peritonitis.
(5) Foreign bodies left in the abdomen.
(6) Tetanus.
(7) Parotitis (septic).
(8) Insanity.
(9) Thrombosis and embolism.

Each will require separate consideration:—

(1) **Shock.**—The degree of shock varies greatly. It is rarely seen after exploratory operations, but the removal of even a small ovarian cyst is sometimes followed by profound collapse. It follows prolonged operations and enucleation of tumours from the mesometrium.

Generally the patient quickly reacts on her return to bed. After severe operations the patient may not regain consciousness for some hours; and occasionally collapse terminates in death.

(2) **Injury to Viscera.**—The organs most liable to injury in the course of an ovariotomy are:—The intestines, bladder, ureter, and the gravid uterus. Each demands separate consideration.

Intestines.—These have been cut and torn in making the abdominal incision. In many cases holes have been made in small and large intestines whilst separating adhesions. The vermiform appendix is very apt to be firmly adherent to a tumour on the right side, and has often been divided and its nature unsuspected. (*See* page 113.) This is serious,

as the subsequent leakage of intestinal contents will nearly always set up fatal peritonitis. In separating tumours, especially dermoids, with deep pelvic adhesions, a hole has often been made in the rectum.

In transfixing the pedicle, the intestine has been wounded with the needle, and even secured to the stump with the ligature.

Hegar mentions a case in which an epiploic appendix included in the ligature caused acute and fatal kinking of the intestine.

In sewing up the abdominal incision, the intestines have not only been pricked with the needle, but even sewn to the wound.

Wounds of the intestines should be immediately secured with fine silk. A wound of the bowel through all its coats if overlooked, is almost certainly fatal. In a few cases of intestinal obstruction, supervening within a few days of an ovariotomy, the belly has been reopened and the obstruction relieved; some of these patients have recovered.

The Bladder.—This viscus has been punctured with the trocar in mistake for a cyst. It should be closed with a continuous suture, and the bladder tested with milk or some bland fluid, in order to be sure that urine will not leak between the sutures. The routine use of the catheter before operation ought to prevent injury to the bladder in abdominal operations. In many instances this viscus has been cut into in the course of the primary incision into the belly, especially when it has been pushed up by a sessile pelvic tumour.

The Ureter.—This duct is liable to injury during the separation of adhesions at the pelvic brim. This accident has necessitated nephrectomy.* Pozzi† is of opinion that the ureter is not infrequently wounded during the removal of an abdominal tumour. When the wound is small the edges should be brought together by suture. When completely severed the proximal end has been stitched to the abdominal wound. In one case of divided ureter the cut ends were successfully invaginated and retained by sutures (Mayo Robson).

* Thornton: Med.-Chir. Trans., vol. lxx. p. 64, case 335.

† *Progrès Méd.*, April 11th, 1891: "Proceedings of the French Congress of Surgery." *See also* Tait: "Diseases of Ovaries," 1883, p. 282.

A ureter divided in the course of the enucleation of a pelvic tumour has been successfully engrafted into the wall of the bladder.

Injury to a Gravid Uterus.—It has already been mentioned that during the performance of ovariotomy the uterus may be gravid; and the operator, ignorant of the condition, may unguardedly plunge the trocar into the uterus.

Under such conditions three courses are open to the surgeon:—(1) Enlarge the incision, empty the uterus, and stitch up the opening in the uterine wall—perform, in fact, Cæsarean section; (2) pass a clamp or serre-nœud around the uterus, and remove it by what is known as Porro's operation: (amputation of the gravid uterus); (3) sew up the wound in the uterus.

Each of these methods has been practised with success. Sir Spencer Wells* and Dr. Byford,† of Chicago, have each reported a case in which the gravid uterus was punctured with the ovariotomy trocar in mistake for an ovarian cyst.

In the case recorded by Sir Spencer Wells this operator had removed a large adherent multilocular cyst of the left ovary, when he felt what was supposed to be a cyst of the right ovary. When tapped it was found to be a gravid uterus. The pregnancy had advanced to near the fifth month. On discovering the mistake Cæsarean section was at once performed. The patient recovered.

In Dr. Byford's case pregnancy had advanced to the seventh month. The ovarian cyst was removed in the usual manner. The trocar puncture in the uterus was enlarged, the fœtus and placenta were removed, and the uterine wound was closed by interrupted silk sutures. Before the wound was closed the cervical canal was dilated with the finger. The patient—a single lady aged twenty-three years, of unblemished character—recovered.

Hillas,‡ whilst operating on a single woman twenty-four years of age, wounded the gravid uterus whilst opening the abdomen. On discovering the accident he removed the ovarian cyst, emptied the uterus, and closed the uterine

* *Med. Times and Gazette*, Sept. 30th, 1865.

† *American Journ. of Obstet.*, vol. xii. p. 31.

‡ *Australian Med. Journ.*, 1875, p. 33.

incisions with interrupted silver-wire sutures. The patient recovered.

Dr. Fortescue,* whilst operating on an unmarried girl twenty-one years of age, found what were supposed to be two cysts. One was tapped and removed. On thrusting the trocar into the second tumour it turned out to be a pregnant uterus. Porro's operation was performed, and the patient recovered.

The third method, of simply sewing up the puncture, has been practised by Lee.† It was a case in which an ovarian cyst complicated pregnancy in a woman twenty-eight years of age. After the abdomen was opened and the cyst exposed, the patient was turned on her side preparatory to puncturing the cyst. This movement displaced the cyst: the enlarged uterus rolled up to the incision and was punctured with the trocar instead of the cyst. The wound in the uterus was sewn up with carbolised silk sutures. The ovarian cyst was removed in the usual way and the abdominal incision closed. The patient recovered, and left the hospital five weeks after the operation. Three days after her return home she presented symptoms of miscarriage. The cervix was dilated, and eventually the child was born. The mother made a perfect recovery.

Dr. Erskine Mason,‡ in performing ovariotomy on a single woman thirty years of age, punctured a gravid uterus. He closed the wound with sutures. Abortion occurred next day. The patient died.

Pollock§ removed an ovarian cyst, and, mistaking the gravid uterus for another cyst, stabbed it with a trocar. Discovering his error, he closed the wound with a silver suture. The patient gave birth to a dead fœtus of about the fifth month a few hours after the operation, and died shortly afterwards. The cyst from this case is preserved in the museum of St. George's Hospital.

* *Australian Med. Gazette*, May, 1884; *Med. Times and Gazette*, Nov. 8th, 1884.

† *American Journ. of Obstet.*, vol. xvi. pp. 286 and 942.

‡ New York Pathological Society, 1877, and *American Journ. of Obstet.*, vol. xii. p. 31.

§ *Lancet*, 1862, vol. ii. p. 257.

These cases seem to show that the best plan is to empty the uterus, dilate the cervix from the uterine cavity, and close the uterine incision, as after Cæsarean section.

The abnormal form of pregnancy, *hydramnios*, has often given rise to great difficulty in diagnosis, and in many cases the abdomen has been opened and the uterus injured before the operator appreciated the true condition of affairs. When in doubt, it is far safer to the patient to determine the nature of the case by means of the uterine sound than to perform cœliotomy, and perchance a Cæsarean section or Porro's operation.

(3) **Hæmorrhage.**—Intermediate hæmorrhage may be due to the slipping of an ill-applied ligature from the pedicle, or an adhesion. The pedicle may also bleed, not from actual slipping of the ligature, but from its being applied with insufficient firmness.

Adhesions which merely feebly ooze when a patient is faint and collapsed will discharge a dangerous quantity of blood when reaction succeeds shock. Severe hæmorrhage is manifested by the well-known signs of internal bleeding—pallor, cold skin, rapid but feeble pulse, and sighing respiration. When these signs are manifested, the wound should be re-opened, the clots turned out, and the bleeding point secured.

Hæmorrhage usually occurs within the first thirty-six hours. After enucleation has been practised, and the broad ligament ligatured, but not drained, bleeding may take place within it and form a hæmatoma. As a rule it is slowly absorbed.

(4) **Peritonitis** used to be a frequent cause of death. Its frequency has been diminished by improved methods of dealing with the pedicle, greater cleanliness, antiseptic and aseptic precautions, and the employment of irrigation, with or without drainage. Peritonitis may arise from infection at the time of the operation in consequence of the escape of pus or other fluid from the interior of cysts or tumours; from sponges and instruments inadvertently left in the abdomen; from operations conducted in rooms in which sewer gas and similar deleterious agents are present; from damage to, and subsequent sloughing of, portions of the

viscera, gangrene of the stump, pieces of adherent cyst wall, or adhesions; from decomposition of blood carelessly left in the pelvis, or that has oozed after the operation.

Its occurrence in a fatal form is not likely to be mistaken. The pulse is rapid, 120, 130, or 140, at first full and bounding, then quickly becoming thin and feeble. The temperature may be subnormal, then slowly rise to 100°, 102°, or 103°. These signs, accompanied by vomiting, the fluid being bile-stained or like black coffee, an anxious and pinched face, sunken eyes, and distended abdomen, form a picture never mistaken when once seen. Death is rarely long delayed.

(5) **Foreign Bodies left in the Abdomen.**—Every writer on ovariotomy insists on the importance of exercising the utmost personal vigilance in counting *instruments*, and especially *sponges*, after an abdominal operation. Nearly all the cases in which foreign bodies are left in the abdomen die unless they are removed, and more than one writer has expressed the opinion that the accident has probably been overlooked where no *post-mortem* examination was made.

In several instances the surgeon has found the number of sponges or forceps short, and, failing to find them about the room, has re-opened the wound and recovered the missing instrument or sponge.

Dr. Holland* has reported briefly the details of a case in which he removed two very adherent ovaries. Symptoms of hæmorrhage set in, and the wound was re-opened. A few hours later the bleeding recurred, necessitating a second re-opening of the wound. Subsequently a sponge was reported to be missing, and eventually the abdomen was opened again, but no sponge was found. Thus, in twenty-four hours this woman was etherised and her abdomen opened on four separate occasions. She recovered.

Dr. H. P. C. Wilson, of Baltimore, reported a case in which he left a sponge in the abdomen, after removing a large ovarian dermoid from a woman five months pregnant. Eighteen days after the operation the patient miscarried. An abscess afterwards formed near the umbilicus

* *Brit. Gyn. Journal*, vol. vii. p. 179.

and five months after the operation the sponge was discharged piecemeal; the patient was subsequently restored to perfect health.*

This case induced him to collect from surgical literature, and from the personal reports of friends, twenty-eight cases in which foreign bodies had been left in the abdomen.

In a few cases a forceps was left behind; in the rest it was a sponge. Dr. Wilson believes that two-thirds of the cases never come to light, partly from the anxiety of the surgeon to conceal the matter, and partly from want of an autopsy.

Wilson's seems to be the only case as yet reported in which a patient has survived with a sponge left in the abdomen.

Since many surgeons have abandoned sponges, some very curious things have been left in the belly.

Salin† (Stockholm) left in a gauze compress. A year later an abscess formed at the lower end of the cicatrix; it was investigated and the compress removed.

Pilate ‡ (Orleans) left in a pad of tarletan. Serious symptoms and a long illness followed. Months later the compress escaped by the anus.

Olshausen § mentions a case in which a pressure forceps was passed by the rectum nine months after ovariotomy.

Nussbaum tells of a drainage-tube that remained two months in a patient's body, when a part of the wound opened after a dance; she at once pulled it out, and suffered no further evil consequence.

Sir Spencer Wells on one occasion left a pair of forceps in the abdomen. The accident was suspected; some hours later the abdomen was reopened and the missing forceps found in a fold of omentum. The same surgeon reports that in a patient on whom he performed ovariotomy, he removed a pair of forceps from the bladder one month afterwards. The patient died.‖

* Wilson: Trans. American Obstet. Soc., 1884, vol. ix. p. 94.

† *Centralbl. für Gyn.*, No. 24, 1892.

‡ *Union Médicale*, March 31st, 1892.

§ "Krankheiten der Ovarien," s. 332, 1886.

‖ "Ovarian Tumours," case 917, p. 336.

A case is reported from Australia* in which a pair of bull-dog forceps and a sponge were found in the abdominal cavity, after a fatal case of ovariotomy. This oversight, however, was not the cause of death.

Terrillon observed a case where pressure forceps remained eight months in the abdomen and came out close to the navel.

In ten years I have witnessed five *post-mortem* examinations in which sponges were left behind in each instance by a different operator. In only one was it the cause of death.

(6) **Tetanus.**—This dread complication of wounds occasionally occurs after ovariotomy, and during the "reign of the clamp" it seems to have been, especially in Germany,† fairly frequent. Cases have occurred in England, and, curiously enough, this serious complication has happened to patients when they have been ovariotomised in a room recently plastered.‡

Since Kitasato has demonstrated the bacillary nature of tetanus poison, and shown that the bacilli can be transported by dust, and that the micro-organisms are killed by oxygen, the established facts that tetanus has ensued when patients have been exposed to draughts, or when the wounds have suppurated, become intelligible.

In practice it is important to remember that *tetanus arises from infection.* Hence all instruments which have been in contact with a case of tetanus must be sterilised, and *this is best effected by prolonged boiling.*

(7) **Parotitis.**—Inflammation of the parotid gland has been many times noticed during recovery from surgical procedures especially after abdominal operations, and with exceptional frequency during convalescence from ovariotomy. The facts relating to this matter have been carefully formulated by Mr. Stephen Paget§; he analysed 101 cases of parotitis ensuing upon injury or disease of the abdomen or pelvis. Of

* *Australian Med. Journal*, 1876, p. 327.

† Olshausen in his "Krankheiten der Ovarien," p. 369, gives a table of thirty-eight cases.

‡ Phillips: Med.-Chir. Trans., vol. lxxv. p. 135.

§ *Lancet*, 1887, vol. i. p. 314.

these, ten followed injury or disease of the urinary tract; eighteen followed injury or disease of the alimentary canal; twenty-three injury or disease of the abdominal wall, sub-peritoneal or pelvic cellular tissue; and fifty, injury, disease, or temporary derangement of the generative organs. Of the fifty cases consequent on injury, etc., to the generative organs, twenty-seven followed ovariotomy or oöphorectomy.

The chief conclusions to which Mr. Paget arrived may be summarised thus:—

This form of parotitis has no period of incubation; it may occur on the first day after the primary lesion, or be delayed until the nineteenth.

It is rarely attended with much disturbance of the general condition of the patient; in the majority of cases there is a slight rise of temperature and rarely rigors.

In a large proportion of the cases the gland suppurates and I have detected staphylococci in the pus. The affection runs no regular course; it may subside, recur, and subside again.

(8) **Insanity.**—Attacks of *acute mania* during convalescence from, and subsequent to, ovariotomy have been several times recorded. Mr. Barwell* communicated a case of this nature to the Clinical Society, London, under the title, "An Unusual Sequel to a Case of Ovariotomy," the sequel referred to being an attack of mania. In the paper he refers to cases mentioned to him by Bantock, Dent, Thornton, and others. Since the publication of Barwell's case many others have been recorded which serve to show that acute mania may be regarded as one of the complications which follow this operation, even after rigid exclusion of transient attacks of delirium due to absorption of carbolic acid employed in the operation.

The attacks of mania in nearly all cases quickly subsided; in a few instances the patient has remained insane for many months.

(9) **Vascular Disturbances.**—Thrombosis and embolism, with their usual sequences, occur after ovariotomy.

Thrombosis is due to the formation of clot in the veins of the pedicle. When ovariotomy is performed during pregnancy, or oöphorectomy for myoma, the veins of the

* Clin. Trans. London, vol. xviii. p. 199.

pampiniform plexus and the uterine veins are usually exceedingly large vessels. After ligature, the blood in these veins may thrombose, and if the patient gets about too soon, the clotting may extend to the iliac veins, and even beyond, giving rise to symptoms identical with those seen in "phlegmasia alba dolens." After ovariotomy, slight swelling of the leg may occur, but with continued rest in bed this soon subsides.

It is a good plan, when a patient has had transient attacks of œdema of one or both legs before the operation, to anticipate complication in this direction by keeping her strictly confined to bed at least a week longer than the usual time. As a rule, when such patients begin to move about, the œdema declares itself, unless they have had a long rest in bed.

Embolism.—Thornton * mentions the case of a woman aged twenty-three years, from whom he removed both ovaries for cystic disease. The patient was doing well up to the eleventh day. "She woke in the night, chatted and laughed with the nurse, and fell back dead." No necropsy was allowed.

Spencer † has reported a case in which he performed an exploratory operation for malignant disease of the ovary and peritoneum. On the twelfth day she died of embolism; the clot was traced to "a sacculus in the iliac vein."

* Med.-Chir. Trans., vol. lxx. p. 55.

† Trans. Med. Soc. Lond., vol. xvii. p. 95.

CHAPTER LIII.

THE SEQUELÆ OF OVARIOTOMY.

We have now to consider the sequelæ or remote risks of ovariotomy. They are :—

1. Intestinal obstruction.
2. Perforation of intestine.
3. Trouble with the ligature.
4. Yielding cicatrix.

Intestinal Complications.—It has been already pointed out that ovarian cysts may cause intestinal obstruction by pressing on the rectum or sigmoid flexure, adhesion of the intestine to the cyst wall, or actual strangulation of the gut by the pedicle.

After removal of the ovaries, whether for cystic conditions or inflammatory affections, the patient still runs some risk of this serious and, as a rule, fatal complication.

It is difficult to estimate with any approach to accuracy the proportionate amount of risk ; nevertheless, an examination of large lists of consecutive operations on the ovaries and Fallopian tubes will show that the danger is a real one.

The obstruction may be acute or chronic, may supervene within a few days of the operation, or be delayed months or even years. The causes are threefold :—

(*a*) The formation of a band.
(*b*) Adhesion to the pedicle.
(*c*) Adhesion to the cicatrix.

Bands.—When intestine has been extensively adherent to an ovarian cyst so that the serous surface becomes destroyed during the separation, such a surface quickly adheres to a neighbouring piece of gut ; the adhesion may lead to the formation of a band, and this may strangle an adjacent coil of intestine.

Adhesion to Pedicle.—The pedicle has often been the

source of danger; a piece of intestine or omentum may contract adhesions to it and lead to fatal strangulation. In order to avoid this accident some operators stitch the peritoneum over the end of the stump.

Adhesion to the Scar.—Adhesions of intestine and omentum to the abdominal cicatrix are by no means infrequent, and have been known to lead to fatal occlusion even six years after ovariotomy.*

This frequent union of intestine to the cicatrix must be borne in mind in performing abdominal section a second time on the same patient. On more than one occasion, ignorance of this fact has led to injury of the gut and subsequent fæcal fistula, with all the distress it causes.

Perforation.—This accident may occur as a result of acute intestinal obstruction following ovariotomy. It may be occasioned by the end of a drainage-tube resting upon a piece of gut instead of the bottom of the recto-vaginal pouch. Should an abscess form around the pedicle, this may lead to adhesion and implication of an adjacent coil of bowel and fæcal extravasation into the abscess. In fortunate cases this abscess will find a vent through the abdominal wound, and a temporary fæcal fistula will be the consequence. With the present excellent method of treating the pedicle, such complications are excessively rare; they occasionally occur as sequelæ to operations for advanced tubal pregnancy.

The risk of a fæcal fistula must be counted among the disadvantages attending the use of the drainage-tube.

Sir Spencer Wells † has given some cases in detail illustrating intestinal obstruction and fæcal fistula following ovariotomy which well repay perusal. The majority of his cases were associated with the use of the clamp.

Ulceration of the intestine is a very unusual cause of death after ovariotomy.

I have once had an opportunity of investigating a case which occurred in the practice of a colleague in which a woman died after the removal of a small ovarian dermoid. The patient was thirty-three years of age, and three months pregnant with her sixth child. The operation was a simple

* Shively: *New York Med. Journal*, vol. xl. p. 292.

† "Ovarian and Uterine Tumours," p. 425, 1882.

one, and as the left ovary was cystic, it was also removed. Her symptoms after the operation were somewhat anomalous, and she died on the eighth day. At the *post-mortem* examination several ulcers were found in the jejunum, one of which, about 2 m. from the duodenum, had perforated and caused fatal peritonitis. There had been no symptoms of obstruction at any time, or any evidence to lead to the supposition that there was disease of the intestine.

The Fate of the Ligature.—When a ligature is satisfactorily applied to a pedicle, it is clear that the tissue on the distal side of the ligature is isolated from the circulation. The fate of this tissue, and of the ligature, has been made the subject of much speculation.

It is a matter of common observation that when animal tissues are cut off from the circulation they atrophy and shrivel. When micro-organisms gain access to such parts, fermentation and decomposition ensue. In due course, through the activity of leucocytes, the dead tissues are detached from the living, a process termed in surgery sloughing.

When a piece of healthy tissue is removed from a living body and immersed in a sterilised solution, and absolutely isolated from the atmosphere, decomposition will be postponed in it for an indefinite time, but as soon as unsterilised air is allowed access to it, putrefaction at once sets in.

The pedicle, after an ordinary ovariotomy, is in an air-tight cavity; the tissues included in the ligature are healthy, hence, when such a pedicle is returned to the abdomen, it resembles the piece of tissue removed from contact with the atmosphere. No fermentative changes occur, but aggressive leucocytes attack and gradually digest the ligature, and in course of time effect its removal.

In order that a piece of silk, gut, tendon, or whipcord applied to a pedicle shall be retained until digested, two conditions must be fulfilled: the ligatured tissue must be healthy, and air must be excluded.

It has been established that after simple ovariotomy the pedicle rarely sloughs, but it is quite certain that when ovaries and Fallopian tubes are removed for inflammatory diseases, such as pyosalpinx, the pedicle is often a source of disaster. In many operations in which drainage is resorted to, the

pedicle is apt to slough and give rise to a sinus, through which the ligature is ultimately discharged.

Many surgeons refuse to believe that the ligature causes trouble; this is idle. In several instances it has formed the **nucleus** of a **vesical calculus**; it has been discharged through the rectum, and in many patients it has, months after the operation, escaped through a sinus in the parietal cicatrix. When the pedicle sloughs soon after the operation, and before adhesions isolate it from the general abdominal cavity, it may cause fatal peritonitis. Edebohls records a case in which double oöphorectomy was performed for uterine myoma. A year later the ligature of the left side came away through the vagina; six months later he performed hysterectomy. The vermiform appendix was adherent to the stump on the right side. It was removed, and 5 cm. from the tip he found a silk ligature, tied in a complicated knot, lying in the appendix and making its way to the cæcum.

Two things cause trouble in the pedicle; the structures composing it are the Fallopian tube, ovarian ligament, and blood-vessels included between the layers of the peritoneum forming the mesosalpinx. When that portion of the tube included in the ligature is the seat of septic changes, it must necessarily endanger the safety of the pedicle and cause it to slough, or set up inflammatory changes around the ligature which not infrequently nullify the good effects of the operation.

It must also be pointed out that one of the disadvantages of drainage is that it admits air into the abdominal cavity, so that if a pedicle contain septic elements, the admission of air will serve to establish decomposition, and in a certain proportion of cases induce separation of the ligature.

An inquiry into this question shows that after simple ovariotomy or oöphorectomy for myomata a properly tied pedicle rarely causes trouble, but when oöphorectomy is performed for the condition known as pyosalpinx the ligature is a source of irritation, and in a fair proportion of cases causes abscess; this is more likely to happen when drainage has been necessary. The local suppuration may lead to general peritonitis, or the pus may escape through the rectum, bladder, or abdominal wall.

Absorption of the Ligature, when silk is used, takes place slowly. In one patient whose abdomen was reopened one year after double oöphorectomy, I found the *knots* only of the silk used for the pedicles. In another instance in which I performed hysterectomy three years after double oöphorectomy no traces of five silk ligatures applied in the original operation were detected after a most rigorous search.

The Cicatrix.—In nearly all instances the abdominal wound rapidly heals. Occasionally a case is met with in which, after removal of the stitches, the wound has gaped, and the edges of the incision re-open down to the peritoneum This membrane fortunately rapidly unites, so that in cases where the wound does not repair, the peritoneum serves to restrain the abdominal contents. I once made a *post-mortem* examination on a woman seven weeks after an oöphorectomy in which there was not the slightest attempt at union in the wound outside the peritoneum. With very rare exceptions, the parietal wound heals rapidly, and the chief trouble is to restrain the patient from moving about too quickly. Care in this respect is very necessary, otherwise the cicatrix yields and a troublesome hernia is the result. After abdominal section, even where the wound heals as quickly as is possible, the patient should be kept confined to bed twenty-one days or a month, and not allowed to get up at the end of that time unless she wears a comfortable and correctly-fitted abdominal belt. This she should be instructed to wear for at least a year; and during that time the patient should be strongly warned against moving about without it. Even at the end of the year, should the scar show indications of yielding, the use of the belt should be continued.

The sac formed by a yielding cicatrix after an abdominal section sometimes attains an extraordinary size. Phillips reported the case of a woman twenty-six years of age, in which the sac was so large that during pregnancy it accommodated the fundus of the uterus and reached "half-way to her knees."

Many causes have been suggested for a yielding cicatrix, such as suppuration of the wound, inserting the sutures too far apart, failure to include all the tissues of the abdominal wall in the sutures, or laborious occupation.

My own experience has been that in those cases which unite rapidly, and the patient when allowed to get about too early has neglected the use of the belt, the scar yields most. Since I have adopted the plan of keeping them in bed, even the most favourable cases, from twenty-one to twenty-eight days, and insisted on the use of the belt, this complication has ceased to cause me trouble.

When the wound is secured by the "triple layer" plan described on page 373 so sound a cicatrix results that the abdominal belt is unnecessary.

Cancer of the Cicatrix.—Several cases have been recorded in which, after the removal of an ovarian adenoma, a new growth, described as "cancer of the cicatrix," has formed in the scar; its probable nature has been discussed on page 56.

HISTORICAL.

1809.—Ephraim McDowell, Kentucky, performed the first ovariotomy. He tied the pedicle, but left the ligature hanging out of the wound. (The patient survived the operation thirty-two years.—Lawson Tait.)

1821.—Nathan Smith, New England, tied the vessels in the pedicle with strips of a kid glove, and returned it into the abdomen.

1850.—Hutchinson introduced the clamp.

1864.—Baker Brown introduced the cautery. Lawson Tait also gives this surgeon the credit of reintroducing and establishing the intra-peritoneal method of dealing with the pedicle which has led to such brilliant results. Doran ascribes it to the systematic advocacy of Dr. Tyler Smith.

Those interested in this subject should read Doran's paper in the St. Bartholomew's Hospital Reports, 1877, vol. xiii. p. 195.

Lawson Tait, "Diseases of the Ovaries," 1883, pp. 238 and 286.

Dr. Stansbury Sutton, Trans. American Gyn. Soc., vol. vii. p. 119.

CHAPTER LIV.

THE EFFECTS OF THE REMOVAL OF THE OVARIES ON THE SECONDARY SEXUAL CHARACTERS OF WOMEN.

In the opening chapter of this book the primary and secondary sexual characters of the human family were briefly considered. The behaviour of these characters after removal of the genital glands in women has not been dealt with in an impartial way, and the consequence is that few opinions in the profession of medicine rest upon such unsatisfactory evidence as those relating to the effects of double ovariotomy, or oöphorectomy, on the secondary sexual characters.

Atrophy of the Mammæ and Abnormal Hairiness.—It is imagined by many that after removal of the ovaries women become hairy about the face, the mammæ atrophy, and they, in short, assume many of the secondary sexual characters of the male.

This error has been traced to two sources. One is the assumption that certain changes observed in birds and deer after injury to, or disease of the sexual glands holds good in men and women; the other source of error is the oft-quoted case reported by Percival Pott.* In this case a robust and healthy woman twenty-three years of age suffered so much inconvenience from a swelling in each groin that after due consideration they were removed. The bodies excised from these swellings were regarded as ovaries, but they were not examined microscopically. The concluding paragraph of Pott's brief account of the case is this:—"She has enjoyed good health ever since, but is become thinner and more apparently muscular; her breasts, which were large, are gone; nor has she ever menstruated since the operation, which is now some years."

This is a typical example of the flimsy evidence on which text-book writers rely. In this case there are only two facts

* "Chirurgical Works," case xxiv. p. 791; 1775.

stated with any approach to certainty; these are: (1) the woman ceased to menstruate; (2) years afterwards her breasts were gone. It must be remembered we have no proof that the bodies removed from the groins were ovaries. In some instances when organs supposed to be ovaries have been removed from the inguinal canals the microscope has shown them to be testes. Dr. Chambers's well-known case is an instance of this, and I have seen four others. The only evidence in Pott's case that the bodies were ovaries is the statement that she menstruated regularly before the operation. I know of no case in which menstruation co-existed with testes, but well-developed mammæ may be associated with testes, as in Chambers's celebrated case (*see* page 29); and it is a curious fact that in this instance it is reported a month after the operation: "The left breast has almost disappeared, while the right remains the same as before the operation." Pott's case no more proves that the removal of the ovaries will lead to the atrophy of the mammæ and the assumption of secondary sexual characters than that the existence of antlers in a doe indicates sterility. As antlered does are instructive in relation to this question, it will be useful to mention very briefly a few facts in this direction.

Antlered Does.—Female deer are occasionally seen with antlers which resemble very closely the stunted specimens seen on the heads of castrated bucks. It is believed by many that such specimens are very frequent, but an inquiry into the matter shows that this is not the case. That female deer put up antlers occasionally is beyond doubt. One of the most accessible specimens is preserved in the museum of the Royal College of Surgeons, London. It is the skull of a doe roe-deer; it was shot by the Earl of Egremont, near Petworth, Surrey, in 1810, and presented by him to the museum. The antlers, to judge from the specimen, were covered with "velvet." One is a simple curved snag nearly 8 cm. in length, with a well-developed burr; the other is a mushroom-shaped burr without any beam. Lord Egremont, in a letter, expressly stated that the deer was *a very old and uncommonly large female, with two young ones in her.* The pregnant condition of this animal must not be regarded as very unusual. In Germany, where roe-deer are more plentiful

than in Great Britain, many does with antlers have been seen; Dr. Altum has observed no fewer than forty instances. Most of these were barren animals, and the antlers were always of a more or less abortive character, except one case, in which the normal male form was well reproduced; *several were fertile*, and were either with young when killed or had

Fig. 146.—Head of a Doe (*Capreolus capræa*) with Antlers. It is beset with exostoses, and is velvet-covered.

recently given birth to fawns. Such abnormal antlers appear to be persistent and permanently covered with velvet.

It has been difficult to obtain precise information as to the actual condition of the reproductive organs in these antlered females, and the statement that they were mostly barren, though significant, is not sufficiently precise for our purpose. In 1791 Hoy briefly communicated to the Linnean Society a few facts about a *one-horned hind*. It was a hind, the female of *Cervus elaphus*, shot by the Duke of Gordon, "which had one horn perfectly similar to that of a stag three years old. It never had a horn on the other side

of the head, for there the corresponding place was covered over by the skin, and quite smooth. It does not seem to have ever produced a fawn, and upon dissection the ovarium *of the same side with the horn was found to be scirrhous.*" * We have authentic evidence of the occurrence of antlers in female deer in the following species: Roe-deer (Fig. 146), Virginian deer, Moose and Red-deer; antlered females in other *Cervidæ* seem to be of very rare occurrence.

Thus the evidence shows that the presence of antlers on a doe is no proof of sterility any more than a slight growth of hair on the lips and chin of a woman indicates barrenness, for most of us could adduce instances of women the unfortunate possessors of a growth of hair on the lip, but mothers nevertheless.

I have made many personal inquiries into this matter, and sought far and wide in special writings for evidence in support of the statement that removal of the ovaries tends to cause abnormal growth of hair. The following are characteristic examples of the evidence:—Olshausen † refers to a case mentioned by W. Atlee in which a woman, after excision of both ovaries, developed a beard fourteen years after the operation. The patient was then fifty years of age. Peaslee mentions three cases in which women with ovarian trouble had tolerable beards. He did not follow up the cases.

Statements of this kind must not be accepted as evidence that the appearance of the beard depended on the removal of the ovaries. Indeed, evidence can be quoted in the opposite direction. Clement Lucas ‡ communicated to the Clinical Society, London, a case of early puberty in a girl seven years of age from whom he removed an ovarian tumour. The external genitals were precociously developed, there was considerable growth of hair on the pubes, enlarged mammæ, and menstruation. After the operation these signs for the most part reverted to their normal state. Before she left the hospital the prominence of the mammæ had much subsided. In contrast to this, Olshausen reports that he removed a large ovarian cyst from a girl of sixteen years who had not

* Transactions, vol. ii. p. 356.

† "Die Krankheiten der Ovarien," 1886, p. 379.

‡ Trans. Clin. Soc., vol. xxi. p. 224.

menstruated. In bodily conformation she resembled a girl of ten or twelve years.

Mr. Knowsley Thornton and Dr. Myrtle* have recorded the details of a very unusual case in which a large sarcoma of the left supra-renal capsule was removed. They write:—"The patient, who was a married lady of thirty-six, mother of one child aged thirteen, had another curious pathological condition, which had developed soon after the oöphorectomy performed by Dr. Keith six or seven years before I saw her. She was covered all over with long silky black hair, and had to shave her face just like a hairy man." Dr. Myrtle writes:—"Here I may remark that the mammæ had disappeared, and that her cheeks, upper lip, and chin were covered with soft darkish down, such as you see on a lad of eighteen or nineteen, and that the arms and forearms were also hairy."

We must not hasten to attribute these changes to the removal of the ovaries.

The tumour of the adrenal was removed in April, 1889. In November of the same year she wrote to Dr. Myrtle: "I am much like my old self, and have all the external appearances of other women." The facts of this case indicate that the tumour had more to do with the growth of hair than the oöphorectomy.

The Effects of Removal of both Ovaries on Menstruation.—Let me now consider the effects of complete removal of both ovaries upon menstruation. This is an important subject, because surgeons occasionally remove both ovaries for the purpose of anticipating the menopause in some cases of uterine myomata.

In 1859 Farre,† in his classical article "Uterus," expressed the following opinion relative to the influence of the ovaries on menstruation:—"Their artificial removal is followed by a permanent cessation of the catamenial flow, although the uterus may be left uninjured." A critical analysis of the evidence adduced by subsequent writers in opposition to this opinion has served to convince me that Farre was absolutely correct. It is beyond all dispute that some women, after both ovaries and tubes have been completely removed, suffer from

* Trans. Clin. Soc., vol. xxiii. p. 150.

† Todd's "Cyclopædia;" Supplement.

discharges of blood from the vagina; but vaginal hæmorrhage of any kind does not constitute menstruation.

The Influence of the Fallopian Tubes on Menstruation.—Before discussing these irregular hæmorrhages, it must be mentioned that the Fallopian tubes exercise no influence on menstruation, and in order to produce artificial amenorrhœa both ovaries must be completely removed. Let me mention a few facts that will show that the tubes exercise no influence.

In 1890 I attempted to perform double oöphorectomy in a woman with a large and rapidly-growing uterine myoma. The right ovary and tube were easily removed. The left ovary was not found, but the left tube was clearly and completely removed. The woman menstruates as regularly as before the operation. In December, 1890, I attempted to remove the ovaries and tubes in a case of very large myoma. The right were removed easily, but the left tube and ovary were so embedded in the tumour as to make their removal impossible. I ligatured the tube firmly with two stout gut ligatures. The patient has not missed a period since the operation.

Ligature of both Fallopian tubes exercises no influence on menstruation, as the following facts demonstrate:—

In 1890 Dr. Champneys * performed Cæsarean section on a dwarf, and in order to prevent fecundation he ingeniously ligatured each tube with a piece of kangaroo tendon. Dr. Champneys, in a letter, informs me that the woman has menstruated regularly since the operation.

In 1892 I carried out a similar proceeding, but used silk. The woman menstruates with great regularity.

It is important to remember that simple ligature of the tubes cannot be relied upon to sterilise a patient. In 1894 I ligatured both Fallopian tubes with this object, using a single silk ligature for each tube, and tying it tightly. A year later the patient came under observation pregnant, and miscarried at the fourth month.

Galabin † performed Cæsarean section, and thought to sterilise the woman by tying the Fallopian tubes with kangaroo tendon. She subsequently came under observation

* Trans. Obstet. Soc., vol. xxxi. p. 136.

† *Clin. Journ.*, May 3rd, 1893.

three months advanced in pregnancy. He refers to another case in which the tubes were secured with fishing-gut, but the patient became pregnant.

In order to sterilise a woman, it is clearly necessary to divide the tube between two ligatures or remove both ovaries.

Of all evidence yet adduced in support of the strange dominant influence of the ovaries on menstruation the following is perhaps the most remarkable:—

Dr. Angus Macdonald attempted bilateral oöphorectomy on a young woman. He removed the left ovary and tube, but failed to find the right one.

In March, 1886, Mr. Lawson Tait tried to find the right ovary, but failed. He took away the fundus of the uterus. In spite of this menstruation continued.

In 1890 Dr. Keith* re-opened the belly, found and removed the right ovary and its corresponding 2·5 cm. of tube. The patient recovered, and menstruation permanently ceased.

We have now to discuss the cases in which so-called menstruation continues after removal of both ovaries and tubes. In a few of the reported cases menstruation appears for one, two, or three periods, then ceases for ever. In others, the patients have amenorrhœa for a few months, then menstruate for a few periods before the flow permanently ceases.

In many cases of double ovariotomy or oöphorectomy blood issues from the vagina within forty-eight hours of the operation, and sometimes lasts two days.

These irregularities cannot be advanced seriously as persistence of menstruation after removal of ovaries or tubes. The same irregularity is reported by women at the climacteric period.

The cases we have seriously to discuss are those in which after removal, or supposed removal, of both ovaries menstruation has persisted.

Knowsley Thornton† attempts to explain this by assuming the existence of a **third ovary**. This explanation must not be entertained. **There is no authentic instance on record of a third ovary.** Specimens reported as

* Keith: "Abdominal Surgery," p. 422.

† Heath's "Dictionary of Surgery;" article "Oöphorectomy."

supernumerary ovaries are usually instances of deeply-fissured ovaries. Several cases of supposed third ovaries lack histological demonstration, without which they cannot be received as evidence. This question was discussed in chapter iii.

It is an important fact that the reported cases of persistent menstruation after removal of both ovaries have usually been patients in which the operation has been performed for chronic inflammatory affections of the tubes and ovaries, or for uterine myoma.

The supposed persistence of menstruation after removal of both ovaries is capable of explanation in two directions :—

(1) In some cases it is due to imperfect removal of the ovaries. They may be so adherent to surrounding parts that it is impossible to be quite sure no ovarian tissue is left.

(2) The persistent hæmorrhage, in patients from whom both ovaries have been completely removed in order to check bleeding due to myomata, is not infrequently caused by the presence of a submucous tumour that has been overlooked.

In regard to imperfect removal of the ovaries, the following is very important evidence :—

Mr. Martin* exhibited at the British Gynæcological Society a uterus removed two years after double oöphorectomy for pyosalpinx. After the oöphorectomy menstruation continued very profusely. Attempts to stop the hæmorrhage failed, and vaginal hysterectomy was performed. On examining the parts, "it was found that a piece of ovary had been left behind."

Pinesse,† in a careful inquiry into the subsequent histories of women after removal of the ovaries and tubes, comes to the conclusion that persistence of menstruation is due to portions of ovarian tissue left behind, and states that in second operations corpora lutea were seen on the stumps of the pedicle left after the primary operations.

This is a very valuable observation, as it indicates that

* *Brit. Med. Journal*, 1894, vol. ii. p. 15.

† *Journ. de Méd. et de Chir. Pratiques*, April 25, 1895.

in many examples of regular menstruation after removal of double pyosalpinx, supposed to be due to irritation of the ligatures, the real cause of its maintenance may have been fragments of one or both ovaries.

Thus Howard A. Kelly,* in a short paper on "The more remote Results of removing the Ovaries and Tubes," writes that he has "several times seen *severe hæmorrhages* a year or two after operation." In 1888 he removed two tubo-ovarian abscesses; the patient had a slow convalescence, but finally recovered complete health. Subsequently she suffered from periodical uterine hæmorrhage. Dr. Kelly discovered a mass nearly 4 cm. in diameter at the right uterine cornu, which he regarded as an old ligature encapsuled. He performed abdominal section, removed a serous cyst apparently within the folds of the mesometrium, and in it found the silk ligature. There was no trace of ovary on either side.

When double oöphorectomy is performed to anticipate the menopause, and menorrhagia persists after the operation, it signifies that a sub-mucous myoma (polypus) exists. This fact has been so often demonstrated that it is needless to adduce examples.

Vaso-motor Disturbances.—The most frequent and most troublesome form of nerve-disturbance that is liable to arise after removal of both ovaries and tubes is the peculiar phenomenon commonly termed "the flushes."

Campbell,† in his interesting work, defines a flush as *a nerve-storm, in which a rush of blood to the skin and a sense of heat are generally the most obtrusive manifestations.*

He then goes on to state that in a fully-developed flush the patient at first feels hot, some portion of the skin being flushed with blood; immediately afterwards, or in a very short time, sweating occurs; finally, while the sweat is still on, or while it is diminishing, or after it has actually disappeared, the patient feels cold or may shiver.

It is not my intention to enter into the physiological side of the question; those who desire to do so should carefully study Campbell's book. My intention is merely

* *The Johns Hopkins Hosp: Bul.*, May 1st, 1890.

† "Flushing and Morbid Blushing," London, 1890.

to consider "flushing" as a sequel to the removal of the ovaries. It is well known that as women approach the menopause they are especially liable to "heats" or "flushes." When menstruation finally ceases, flushes may recur so frequently as to cause the patient much distress.

In the course of two years they so diminish in frequency and force that the individual is no longer distressed by them.

When the menopause is suddenly brought about by the removal of the ovaries, these flushes begin to manifest themselves, and in some patients they are very distressing. I have made many observations on such cases, and find it impossible to foretell before the operation whether a given patient will suffer from flushes or not.

I find that the phenomenon ensues upon the operation quicker in women who are near the menopause; it lasts longer, is more frequent and more pronounced in them than in younger women. It seems to follow equally after double ovariotomy, oöphorectomy for inflammatory conditions and for myoma. In one patient the flushing began three days after the operation; in most cases it is delayed some months, and in a few the flushes are not frequent until a year has elapsed.

In one patient the flushes recurred ten times an hour, and this went on for several months. In women between twenty and thirty the flush is, as a rule, very mild even when frequent.

My observations induce me to believe that they are more severe after hysterectomy in women between the fortieth and fiftieth years. After this operation there is another very remarkable condition which other surgeons must have observed; it is this:—On comparing a number of temperature charts, it will be seen that in many there will be found a very sudden rise of temperature; sometimes it will reach as high as 105°; usually it is 103° or 104°. When this occurs, the surgeons may feel that something is wrong with the patient, yet she will appear comfortable, and her general condition is not consonant with the temperature record. When this is the case, a cautious inquiry will show that the day on which the temperature rose, according to

the patient's reckoning, would be the date on which she would in the ordinary way expect to menstruate. I have tested this often in my own patients and in those of other surgeons. Knowledge of this fact has on several occasions spared me much anxiety.

With regard to treatment, I know of no drugs which will have any effect in preventing or in any way diminishing the force and frequency of the flushes. I have tried many, but now adopt no form of treatment, but endeavour to comfort the patients by the assurance that the vaso-motor storms will slowly diminish, until they cease to be even inconvenient.

Sexual Desire and Nubility.—The influence of the loss of the ovaries upon the sexual passion of a mature woman is such a difficult subject that it cannot be usefully discussed. The question of nubility is equally difficult. It is, however, certain that many women who have had their ovaries removed have married.

The subject-matter of this chapter may be summarised thus:—

There is no evidence that the complete removal of both ovaries in a mature woman leads to any unusual development of the secondary sexual characters, or atrophy of the breasts. It may cause obesity in a woman who has a tendency to form fat. Complete removal of both ovaries is followed by sterility and persistent amenorrhœa.

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THE END.

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